Vol. XV No. 3 SEPTEMBER, 1950

# THE TOOL ENGINEER



OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

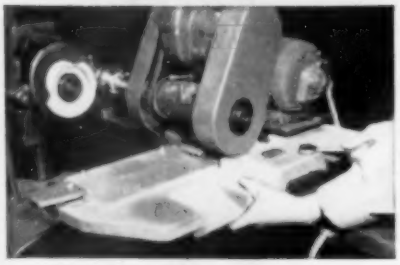


## Departments

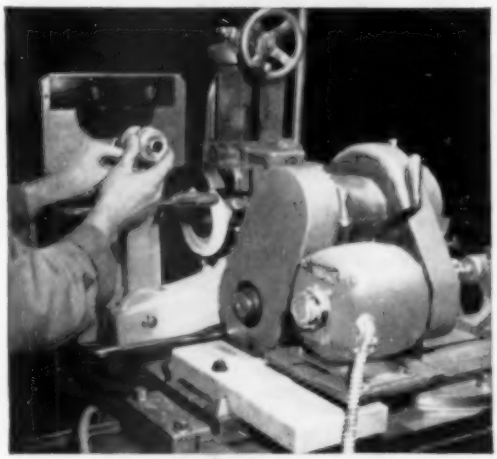


Behind every manufactured product is the tool engineer

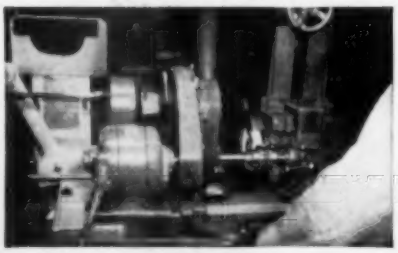
# PRATT & WHITNEY Diaform CALLING ALL USERS OF UNIVERSAL AND TOOL GRINDING MACHINES



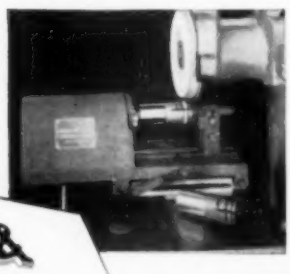
**1.** A time-saving "natural" is the Pratt & Whitney DIAFORM Wheel Forming Attachment. It gives you the ultimate in precision tooling with which to attain maximum speed, convenience and accuracy in the form-grinding of circular forming tools, crusher rolls, flat formers, split dies and similar work. Photo shows how an Adapter, especially designed by Pratt & Whitney for a Universal and Tool Grinding Machine, fits on the end of the swivel table. On it you set up the DIAFORM Attachment — *and leave it there!*



**2.** Here is DIAFORM in action. Operating on the pantograph principle, the operator simply traces the profile of an inexpensive template by hand. At a reduction ratio of 10 to 1, DIAFORM traverses the diamond over the wheel to form the contour *to tenths of a thousandth accuracy* on wheels up to 10″ in diameter, on contours up to 1″ in width x ½″ in depth — in a matter of minutes.



**3.** The P&W Adapter does not interfere with normal grinding, nor is it necessary to remove DIAFORM from the Machine. It's right there, always ready for quick, accurate repeat truings. Close-up pictures the grinding wheel — its profile now DIAFORMED to precision limits — grinding a circular form tool held between centers. Templates for DIAFORMING are easily produced, easily mounted, easily stored.



The Pratt & Whitney DIAFORM is portable . . . works with equal speed and precision on any make Surface Grinder. For such machines, the DIAFORM and a Cylindrical Grinding and Indexing Attachment are ideal companion tools. Both form the perfect combination for grinding exact contours of screw machine circular form tools and similar work. Get full details on both from Pratt & Whitney.

Circulars tell the whole DIAFORM precision wheel-truing story. Write for your copies.

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**SEPTEMBER 1950**

Vol. XXV No. 3

***Editorial***

# A Duty and a Privilege

THE OUTBREAK of fighting in Korea, and the deepening crises in other parts of the world have revived many activities which were so familiar to us a few years ago. Defense orders have again begun to flow, and in addition orders amounting to billions of dollars are being held in abeyance until such a time as more tooling and equipment are needed.

We as a technical society and particularly as individual tool engineers have an obligation to industry and to government in this transition stage of preparation. We owe our cooperation to the fullest extent in making available our experience, our abilities and our training in order that this program may be carried out with despatch and success.

We have a unique position as a society, in that within our membership we have a concentration of tooling and production talent not to be equalled elsewhere. Our combined knowledge, even with the projects sponsored by the Society to date, has virtually been untapped. This information must further be disseminated among our own members, and made available as well to industry as a whole.

How can this be accomplished? We must work more closely with ASTE groups and projects engaged in the distributive end of education and knowledge—those projects such as *The Tool Engineer*, the Tool Engineers Handbook and ASTE's technical meetings which are set up to carry information to our members and associates. We must work more closely with groups which are organized to provide technical aid to manufacturers in production which is vital to our country and yet is new to these manufacturers.

There is a great challenge here—and a great opportunity. ASTE as a society will be measured in terms of the aid which we provide and the cooperation which we offer. Let us offer a full measure.

H. L. Tigges

*President 1950-51*

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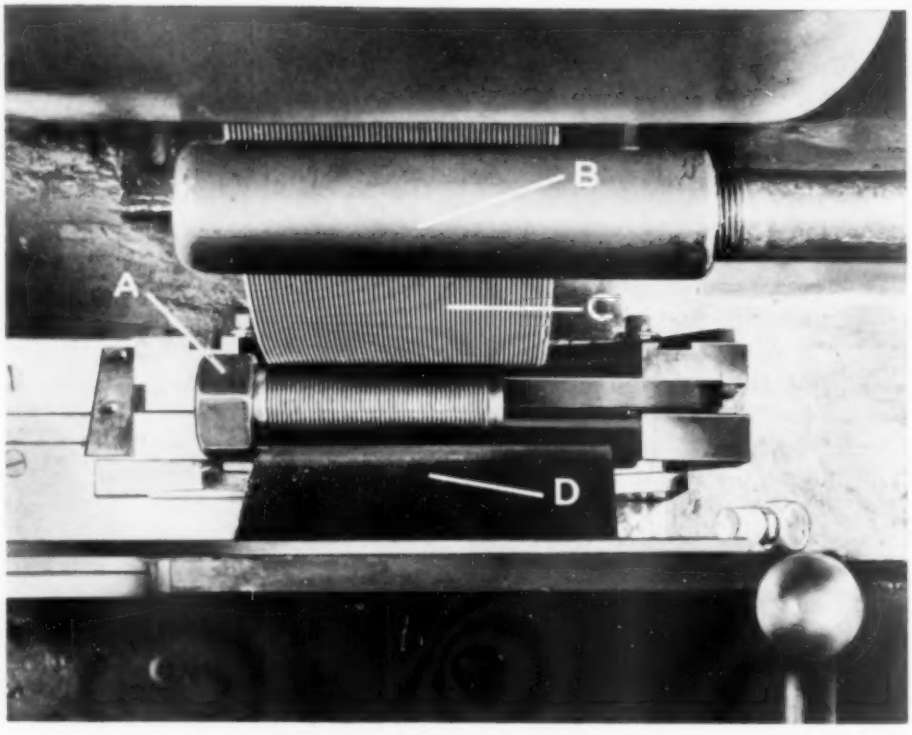
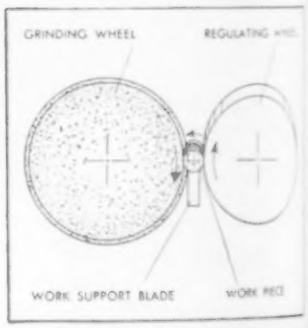
# UP-CUTTING

## A NEW Centerless Thread Grinding TECHNIQUE

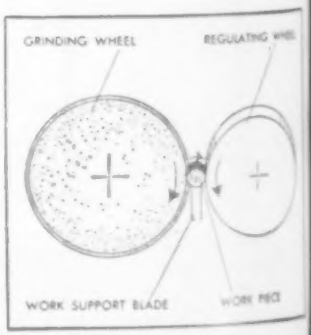



• Engineering research in our laboratories has developed a revolutionary new technique in centerless thread grinding—"up-cutting." The difference between "up-cutting" and "down-cutting," the method generally used for centerless cylindrical grinding and centerless thread grinding, is illustrated diagrammatically below. The new technique is generally to be used for infeed grinding and for large workpieces requiring coarse-pitch threads.

*A—Hex-Head Cap Screw; B—Coolant Nozzle; C—Grinding Wheel; D—Regulating Wheel.*




DOWN-GRINDING




UP-GRINDING

### GREATER WORK SURFACE SPEED—BETTER THREAD FINISH

• In "down-cutting," the surfaces of the workpiece and grinding wheel move in the same direction at the point of contact. In "up-cutting," the surfaces of the workpiece and grinding wheel move in opposite directions at the point of contact. Stresses imposed are reduced and work surface speeds can be used up to 30% greater than for similar "down-cutting" conditions, with fewer wheel dressings. All forces act downward, holding the workpiece firmly on the workrest blade and reducing chattered finishes under heavy cuts. The regulating wheel solely controls work rotation and the end-wise travel in timed relation to its rotation, completely independent of friction between the grinding wheel and the workpiece. Spinning of the work is practically eliminated, especially when grinding coarse threads on heavy workpieces.

***Write for Bulletin E-97.***

# LANDIS *Machine* CO.

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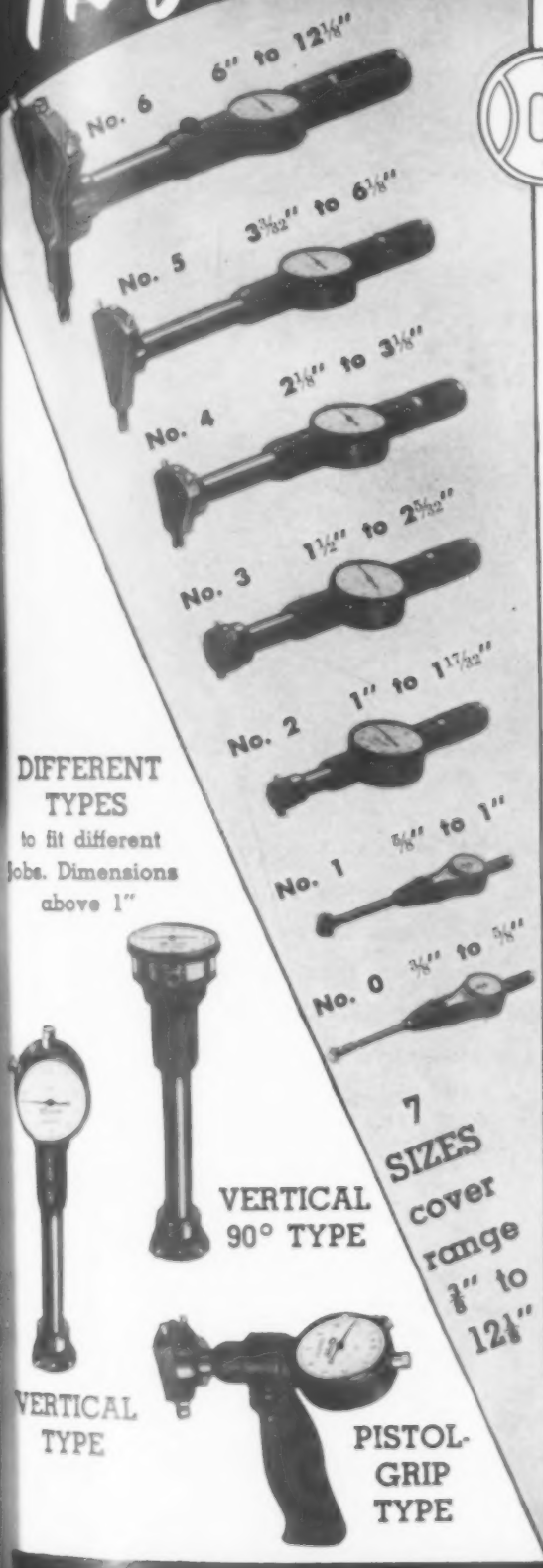


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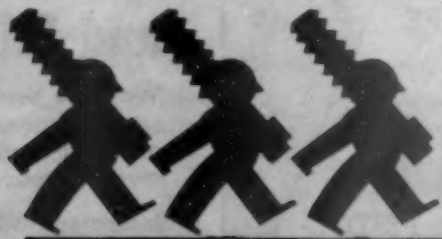

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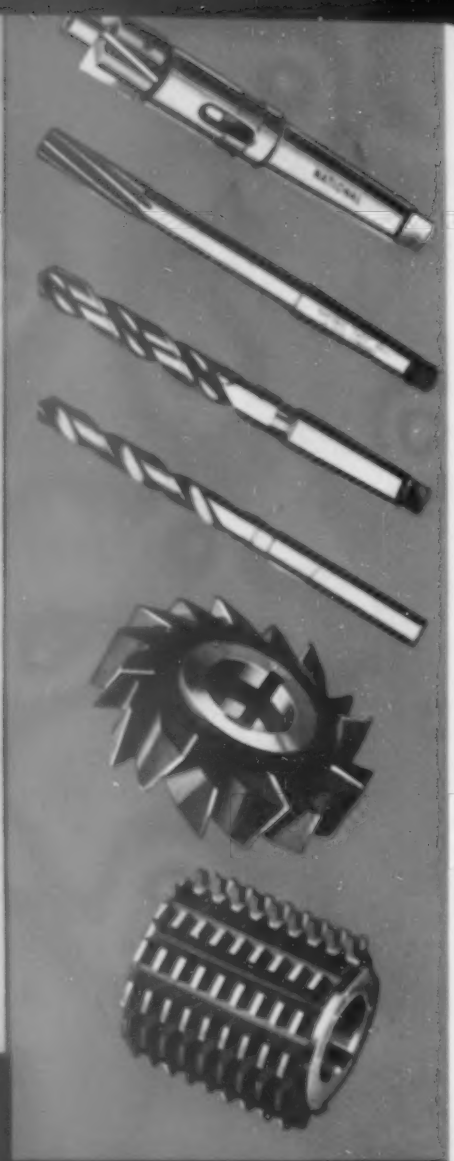


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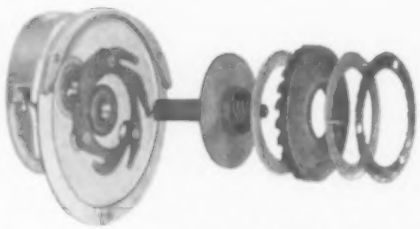
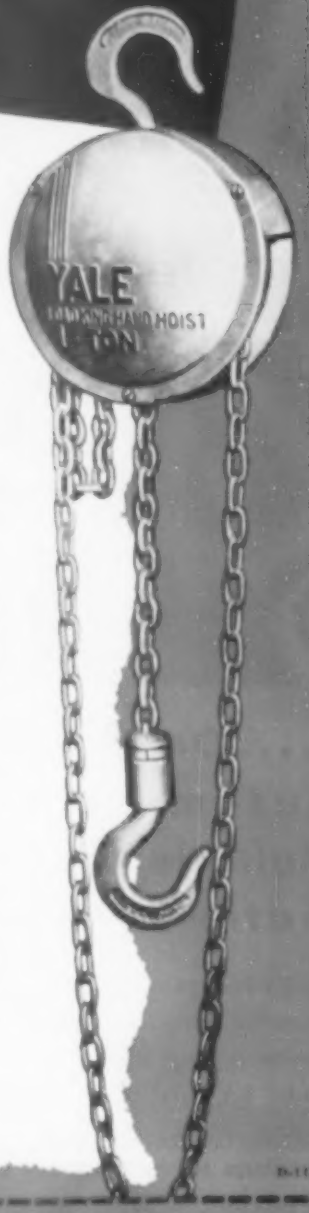
## ...the New Lightweight Hoist with the Revolutionary Synchro-matic Load Brake and every other Performance Feature You Want



You want a compact hand hoist that's easy to move around. You want greater hoisting efficiency to speed production. You want a hoist that doesn't leave the operator droopy and dragged out after a few lifts. You want all these performance features without any skimpiness in quality and durability.

*The Yale Load King Hand Hoist gives them to you—and more!* For only the Load King employs the new, improved principle of instantaneous brake action provided in the Synchro-matic load brake. Maximum braking power, automatically! A 6-tooth pawl engages a 24-tooth ratchet at 6 points simultaneously with balanced and cushioned spring pressure . . . no side pressure on bearing surfaces . . . longer pawl life. Furthermore, a stabilizer ring gives a soft, even and lighter hand chain pull — speeds brake release for precise inching when lowering a load.

The Load King is a lightweight, powerful, easy-to-use hoist that's really tough—and safe. It has the same rugged stamina that has made Yale Hoists the first choice of industry for more than three generations. Precision engineering, the finest materials, machining to close tolerances, careful tests and inspections — all make the Load King the hoist you can trust to pay off big.




### GET ALL THE FACTS

Now is the time to learn all about the new Yale Load King — its powerful Synchro-matic hoisting performance—its attention-free reliability—its enduring quality. Complete information is yours on request. Ask for Bulletin P-1254. Do it today.

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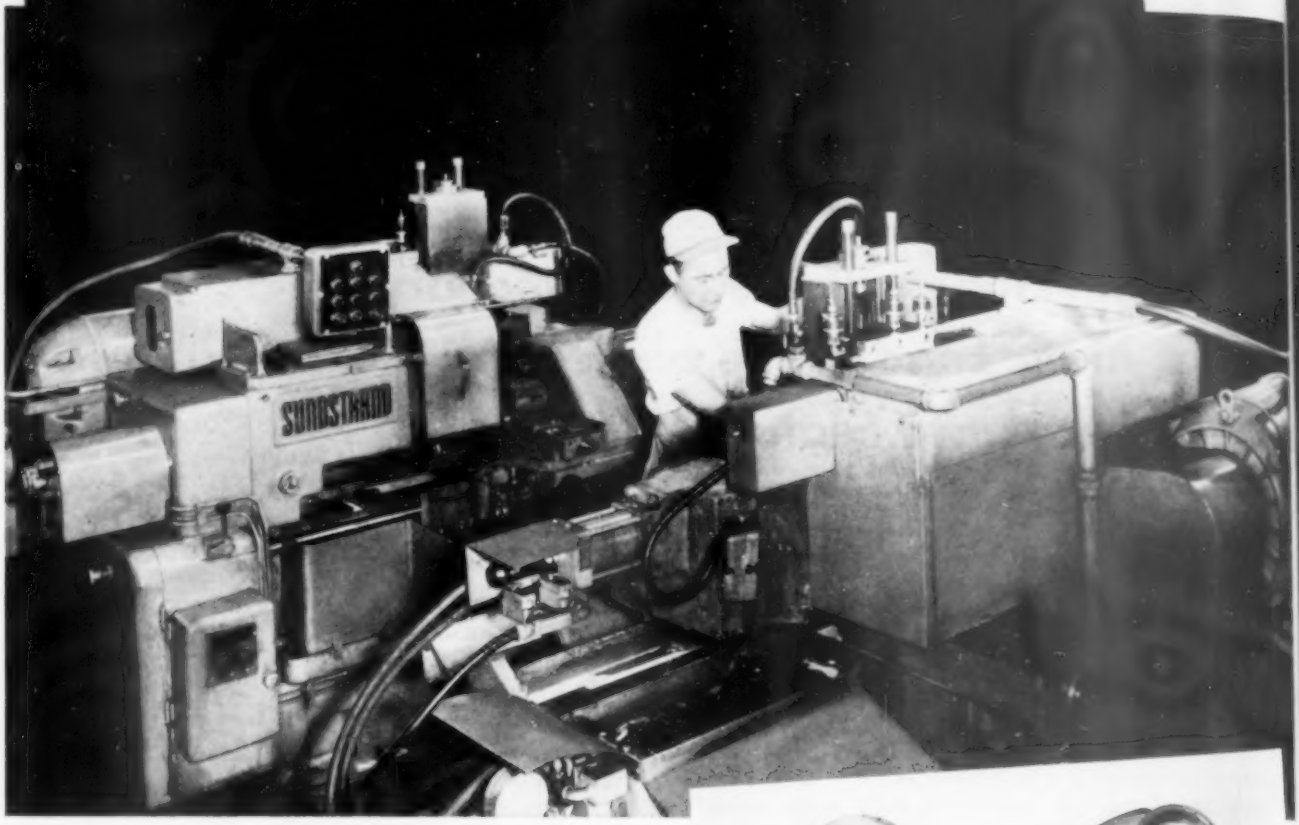
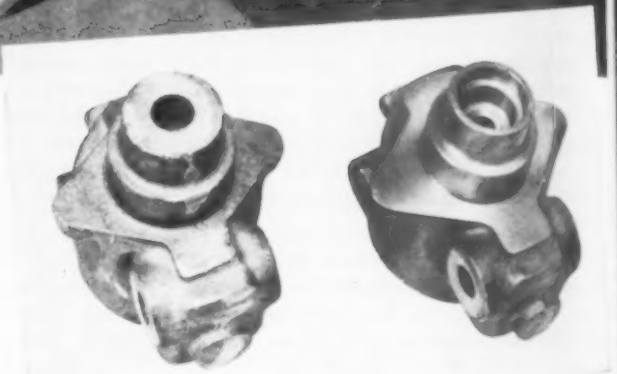
# Production Increased From 40 to 132 Pump Bodies Per Hour




## .....On SUNDSTRAND *Automatic Lathes Using Multiple Tooling and Automatic Cycling*

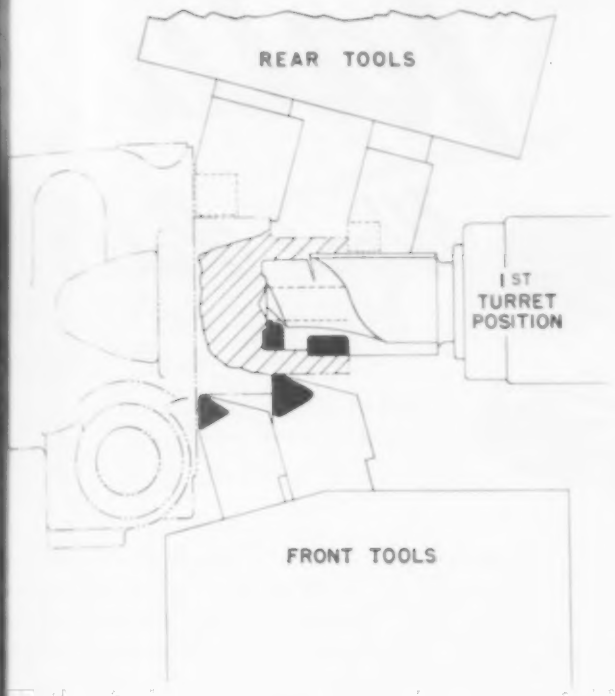


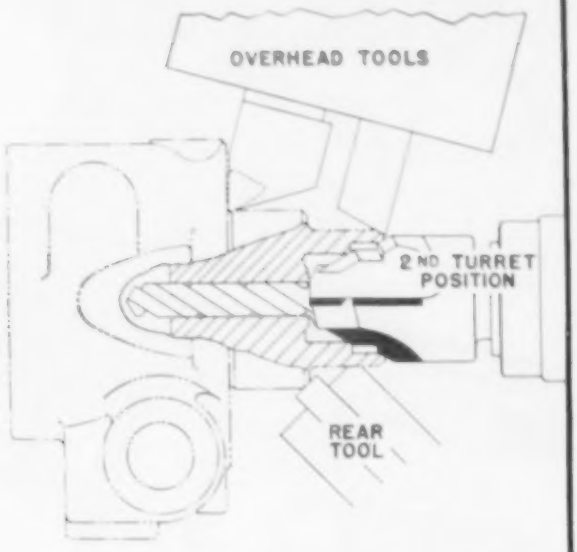
Pump body castings before (left) and after (right) turning operation on Sundstrand Model 8A Automatic Lathe.

Here's fast, profitable machining of a pump body part requiring turning, facing, chamfering, drilling, and counter-boring operations. All are performed on a Model 8A Sundstrand Automatic Lathe with multiple tooling and automatic cycling. Two of many features contribute to the efficiency of this installation. First, the machine is automatic and completes a rough and finish cycle once started by the operator. This enables one operator to run two machines and produce 132 bodies per hour instead of 40 per hour as obtained with the previous equipment and method. Second, indexing of the insert type tools is fast and accurate minimizing time out for changing tools. Other features of this and all Sundstrand Automatic Lathes include simplicity of setup and quick changeover which make it possible to turn both long and short run work profitably. It will pay you to investigate these features. Further, have Sundstrand engineers assist you with tooling recommendations. There is no obligation for this service.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

**RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT**

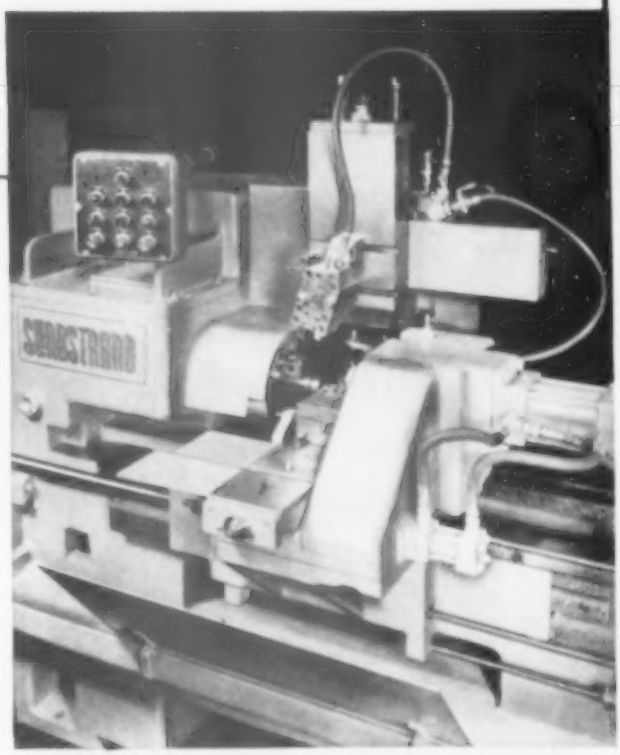



## Eleven Tools Work Automatically To Rough and Finish Critical Surfaces

The tooling diagram illustrates the number and type of tools used on this job. The illustration to the right shows the position of the overhead slide and turret. The machine cycles twice automatically with automatic indexing of turret to finishing position and automatic re-setting of front slide tools to depth for finish turning cut. Machine has two speed motor which automatically steps up to high speed for finishing cut.

If you have turning operations in your plant, it may pay you to consult a Sundstrand engineer. He may be able to combine operations for faster and more profitable machining.




## FREE Additional Data

This new booklet will give you complete engineering data on the new Sundstrand Model 8A Automatic Lathe. Typical turning jobs and physical dimensions are included. Write for your copy today. Ask for Bulletin No. 799.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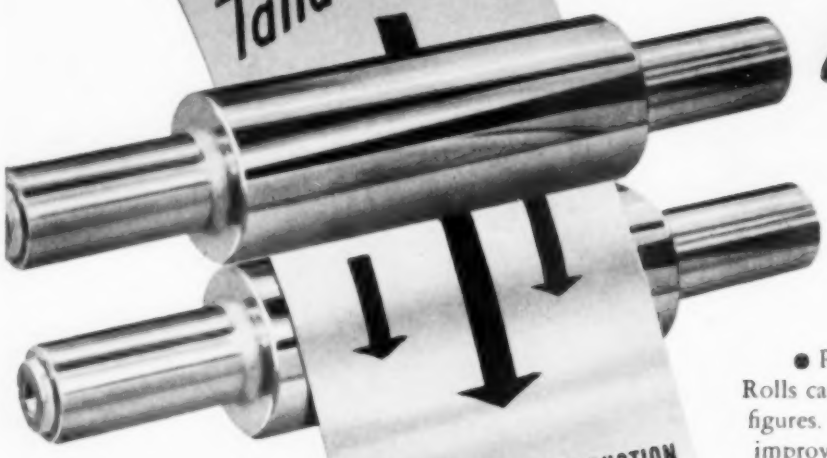
# 7 Reasons why mills use Talide Rolls

# Talide Work Rolls



*Solid Carbide Rolls*
*(weighing up to 1000 pounds)*
*for Strip or Sheet*

1. MORE PRODUCTION
2. BETTER FINISH
3. HIGHER SPEEDS
4. LESS DOWN TIME
5. CLOSER TOLERANCE
6. GREATER REDUCTION
7. FEWER REJECTS


● Profitable, increased tonnage with Talide Carbide Rolls can be had. Mills regularly report astounding new figures. What's more, increased operating speeds and improved surface finish make subsequent polishing and buffing unnecessary.

Talide Tungsten Carbide Rolls are used for ordinary finish or mirror-finish on such items as cold rolled stainless, spring steel, razor steel, alloys, carbon, aluminum foil, tinsel ribbon and flat wire.

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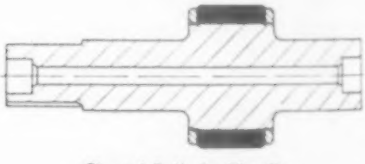
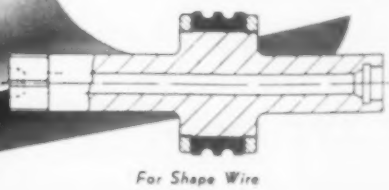
Write us today. We'll show you how to get *more production, better finish, higher speeds, less down time, closer tolerances, greater reductions* and *fewer rejects* on your mill operations.



*Sleeved Rolls for Flat Wire*



*For Shape Wire*

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# NEW!

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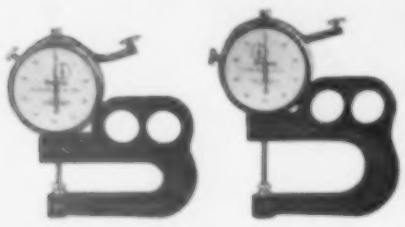
These new Starrett Dial Indicators bring you dependable Starrett accuracy in a new and highly versatile form. Designed for the widest possible application to production inspection with new and exclusive Starrett features, you can count on them to bring greater efficiency and economy to your quality control operations.



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With universal friction holder and universal shank for infinite adaptability. Also features reversible action and hard chrome plated contact point with ratchet joint. Graduated .001", reading 0-15-0, range .030".

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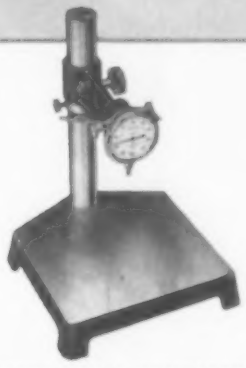
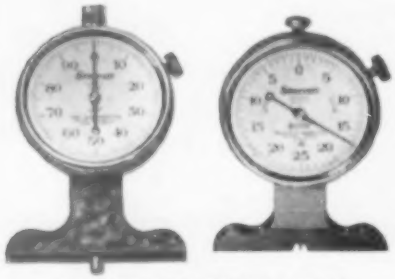
With sliding table and fine adjustment. Vertical capacity 1¾". Throat depth 1⅝". Indicator graduated .0005", reading 0-25-0, range .125".



**STARRETT DIAL COMPARATOR No. 653**

With fine vertical adjustment. Base platen 9" x 9⅝". Vertical capacity 9¼". Throat depth 5". Indicator graduated .001", reading 0-50-0, range .250".



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# Evaluating Tool Performance

**By Thomas Badger**

HEADQUARTERS MANUFACTURING ENGINEERING DEPARTMENT
WESTINGHOUSE ELECTRIC CORPORATION

SELECTION OF A CUTTING tool material is complicated by the fact that each of the three major classifications—high speed steel, cast alloy, and tungsten carbide—are available in several types and grades, and each of these is offered by many manufacturers.

In order to evaluate these many cutting tool materials it is necessary to continually conduct tests to formulate comparative results. A method of tool evaluation has been developed in the Headquarters Manufacturing Engineering Laboratory which accurately predicts shop results for cutting tool materials. This test enables a tool material to be evaluated, and provides a check on the efficiency of stock tools in a few hours of laboratory testing. It is a simple lathe test, and, although it may seem that such a test is not an adequate standard for a tool material that may be used in dozens of different applications, experience has shown that the test will accurately predict whether a tool material will perform satisfactorily or fail when used in the shop.

Effectiveness of the test requires knowing under what conditions to perform the test to get dependable results. A lathe-type test gives good results because no matter how complex a cutting tool may be, when reduced to essentials, any single point on a complex cutting tool acts exactly like a tool when used as a lathe tool. Since knowing "how" to perform the test is so important, the method of determining the cutting conditions for the test will be explained in detail.

Fig. 1 shows three speed-tool life curves and illustrates the form of all such curves. At this time we will consider only the curve labeled as an "acceptable material". Note that for all values of cutting speed lower than the point *F* the curve is a smooth parabola, so that as cutting speed is increased, tool life increases. It is obvious from the shape of the curve that tool life increases much faster than the increase in cutting speed. Note also that for cutting speeds higher than point *F* on the curve, the form of the curve is no longer a parabola, but simply drops off and tool life rapidly approaches zero as cutting speed increases. This indicates the cutting speed at which tool failure will be almost instantaneous.

It might appear that the determination of this point would provide a good criterion of a tool material's efficiency. But laboratory experience has shown that tests based on determining this point are not reliable. In fact, this area beyond *F* of any speed-tool life curve is very erratic, and data taken on this portion of the curve are of no practical value. Points beyond this knee of the curve must be avoided in cutting tests. As an economy measure, high test speeds are desirable, but it has been found that a cutting speed about 15 to 20 percent below the cutting speed at the knee of the curve will produce accurate results with the highest economy consistent with good results. In setting up any new test the first step is to make sufficient preliminary tests to determine the position of the knee on the speed-tool life curve. A test speed from 15 to 20 percent lower than this point is then selected.

## Speed-Tool Life Relationship

An examination of the three curves on Fig. 1 will show that they are all of the same shape and are proportionally equidistant from each other throughout their length on the cutting speed axis. This is true throughout the range of speeds normally used in production, but at very slow speeds the curves will tend to come together. In fact, all tool materials—high speed steel, cast alloy, and carbide—cutting the same work material tend to have identical tool life at very low cutting speeds. This is of no importance, as the object of all tool development is to determine the highest practical cutting speed, rather than the lowest cutting speed.

Although not shown by the curves of Fig. 1, a change in cutting feed, depth of cut, machinability, tool design, coolant, or severity of the cut will shift the position (but not the general shape) of the speed-tool-life curve.

Fig. 2 is a typical curve that illustrates the effect on tool life as cutting feed is varied (other factors remaining fixed). Note that this curve in its general shape is suggestive of a cotangent curve, but over the greater portion of its length—which fortunately is for the usual range of

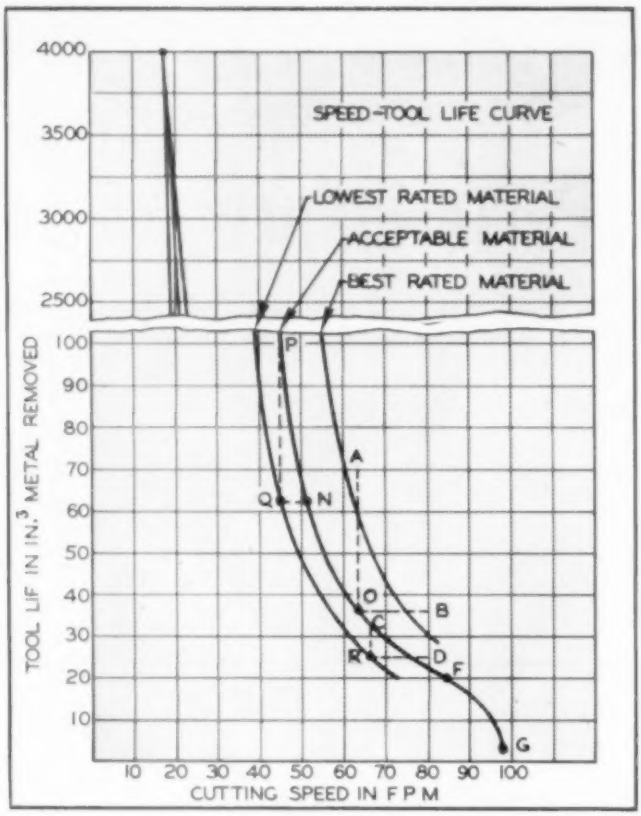


Fig. 1. Three ratings are shown here, plotted in terms of cutting speed versus cu. in. of metal removed.

commonly used shop feeds—it is very close to a straight line. Fitting the actual curve mathematically is quite laborious, but if the straight line is accepted, the solution is simple. For our purposes, it is necessary to know only that for constant cutting speed the speed-tool life curve will be displaced up or down at the slope of this curve. In using this curve to select a feed for a tool test, any desired feed along the portion of the curve which nearly fits a straight line is satisfactory. For the conditions shown in Fig. 2 a feed of from 0.020 to 0.030 in. would be best, and the feed at the point of intersection of the actual and assumed curves would probably be the best value in this case.

The depth of cut will also affect the speed-tool life curve. For depths of cut less than the nose radius of the tool, a variation in depth of cut has a great effect on tool life; but after the depth of cut reaches two times the radius, the effect of depth of cut is slight. For example, when using a tool with a 1/64 in. nose radius, when the feed is changed 0.001 in. at 0.020 in. depth of cut a change of 4 in.³ of tool life results. In contrast, the same change of feed at 0.250 in. depth of cut gives only 1/10 in.³ change in tool life. This indicates that the effect of depth of cut at 0.020 in. is 40 times as great as the same change is feed at 0.250 in. depth of cut. All that is necessary as far as depth of cut is concerned is to select a depth of cut deep enough to be in the area where small errors in depth setting will not cause large errors in tool life values. At the same time a low depth of cut is desired for economy. For all practical purposes a depth of cut of $\frac{1}{8}$ in. has been found to give satisfactory test results.

## Making Test Practice

In test practice at the Manufacturing Laboratory, test logs are made from a single lot of steel and heat treated at the same time in quantities sufficient to last for several years. This is to eliminate variations in machinability of the test material. However, small variations between logs and on different sections of the same log exist. A test coupon is taken from each log and any logs showing a variation of more than plus or minus 10 Bhn are rejected. This variation is minimized by testing as many tools as possible in sequence. That is, if three lots of tools, Lot A Lot B and Lot C, are being tested, the individual tests are made in the following sequence: A-1, B-1, C-1, A-2, B-2, C-2, A-3, etc. This tends to average out any unavoidable variations in machinability. Incidentally, when using cast iron logs it has not been found possible to get test logs cast to the hardness tolerances shown above, so it has been necessary to accept logs within a range of plus or minus 20 Bhn. In the case of cast iron it is known that microstructure has a far greater effect on machinability than hardness, so a microphotograph is made of each cast iron test log. Logs showing wide variation in structure and graphite distribution are rejected. When changing from one lot of test logs to another, a machinability test is made to determine the relative machinability of the two lots, and test speeds are adjusted to suit the new lot of test material. For example, a test speed of 90 fpm may have been used with a lot of test material whose machinability index was sat at 1.00, a new lot of material may show a machinability index of 0.93. In this case the test speed would be changed from 90 fpm to 0.93 x 90 = 83.7 fpm. The details of machinability testing would require more discussion than this article can give the subject, but briefly the technique consists of making a speed-tool life curve for each material and then setting the machinability index as the average ratio of the cutting speeds of the two curves over a fair range of speeds where the curves are parallel.

## Standardized Tool Design

Tool design and the quality of the tool grind will also affect the results of tool tests. The effects of tool design are eliminated from the test results by using a standardized tool such as shown in Fig. 3. This tool may vary in size (such as when testing carbide tipped tools), but the shape remains constant. In grinding, the practice is to control the shape by cam grinding to assure that the tools are of uniform shape. All tools are diamond lapped as a final operation. Each tool is Rockwell tested to assure that the tool hardness is uniform. Efforts have been made to control the surface finish of the tool grind by profilometer reading. This method was rejected in favor of a standardized grinding procedure and visual inspection prior to use.

All routine tool testing is done without a coolant, so this effect is eliminated. Coolant testing is carried on as another activity, and is not included in tool testing, as this only introduces the possibility of another variable to influence test results.

The severity of the cut has a profound influence on test results, particularly when testing carbide tool materials, as the severity of the cut must be matched to the grade of carbide being tested. For testing a tool under severe interrupted cuts the test log is slotted with four slots so that the tool receives four severe shocks per revolution. High speed steel tools can be tested by normal procedure on this type of test, but cast alloy and carbide tools ground as in Fig. 3 will fail instantly under such a test. In this case a negative rake tool design is used. The design has a 15 deg negative back rake with a 15 deg positive side rake and a 0.010 in. flat ground on the cutting edge, and is a standard Westinghouse grind for negative rake tools. It has been found that this test will distinguish tools as to quality for applications where shock is a major factor. The test is not used with other than carbide tools because

that HSS or cast alloy tools, under this type
fall in the same general order as if the tools
to the standard continuous cut test. This
with carbides and the test must be matched
being tested. Here considerable judgment is
the test must be matched to the average ap-
the carbide grade to be tested. For example,
carbide for precision boring may be tested on con-
at 1200 fpm, 0.010 in. depth of cut and
At the other extreme a grade of carbide for
cutting may be tested on a slotted log
in. depth of cut and 0.022 in. feed using
rake tool. Here too, care must be exercised to
the various grades being tested are comparable.
Westinghouse this problem is simplified by the fact that
standard is available that lists each manufacturer's
comparable to a class of application. Carbide tools
tested in groups according to the grade specified
each standard application. The principles given apply
carbides, but the analysis must be completed for each
of carbide tested and a separate test designed to fit
class of carbides being tested.

One practical problem that immediately appears when any
is actually started is how to determine the end point
tool life. Several years ago a tool was considered ready
regrinding only when actual tool failure occurred. It
later found that results were more accurate if the point
partial breakdown (minute chipping of the cutting
at the nose radius) occurs, as indicated by a change in
finish, was taken as a limit of tool life. This method
was not completely satisfactory, so the point where a
wore 0.002 in. (as evidenced by a change in work
of 0.004 in.) was used as the limit of tool life. This
satisfactory, and was further useful because in the
Laboratory the results of tool tests are also
data upon which to predict optimum cutting
Setting the limit of tool wear as 0.002 in. en-
data to be set to predict when a tool should
rather than when a tool will fail. Recently a
method has been developed, which consists
the rate of tool wear by graphical methods
results. Both of these methods have enabled test
to be duplicated with an accuracy of less than plus
2 percent.

## Setting Up Test

Now let us consider all the above information as it ap-
to actually setting up a tool test. In the foregoing
each of the factors necessary to consider has
treated as if the other factors had no effect. This is
from true. Also, if a complete investigation of every
were to be made for every test, the cost would be
Actually, for any class of tool material and
material, the average cutting conditions are known
shop practice or previous test results. In a few in-
involving experimental materials, these facts are
known but can be approximated by actually turning a
of the test material with the test tools. In setting
a tool test the following general procedure is followed:

1. A nominal value of feed (usually from 0.015 in. to 0.050 in.) and a nominal depth of cut (over 0.100 in.) is selected.
2. Using these conditions, a preliminary test is made to determine a cutting speed that will give the point of almost instant tool failure. This point is illustrated at *G* in Fig. 1.
3. Using this point as a basis, the previously described method is used to construct a speed-tool life curve

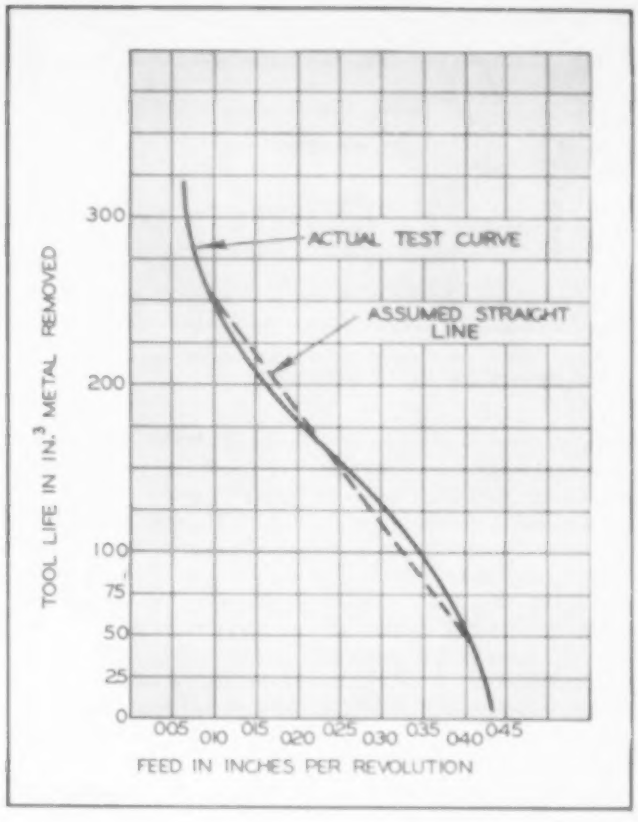


Fig. 2 illustrates the effect on tool life as cutting feed is varied.

such as *GFON* of Fig. 1. It is necessary only to make sufficient tests to determine the shape of the curve for cutting speeds about 30 percent less than that where the knee of the curve occurs. In Fig. 1 the knee would be at *F* where speed is 84 fpm. A cutting speed of about 80 percent of this value, say 67 fpm, would then be selected for the standard test speed.

4. Using this speed and the previously selected depth of cut, only three feed tests need be made; one at the original test feed, one about 0.005 in. higher, and one about 0.005 in. lower. If these tests are placed on a graph such as Fig. 2 and the points fall on a reasonable straight line, the originally selected speed is satisfactory. If this is not so, sufficient tests must be made to determine the straight line portion of the feed curve and the preliminary speed test repeated, using the new value of cutting speed.
5. For any value of depth of cut in excess of 0.100 in., no adjustment is normally required, but if desired, check tests at a depth of a little greater and a little less than the selected value can be made to determine if small variations in depth of cut show excessive changes in tool life.
6. Using the above selected values the test can be set up, the only precaution being that every effort should be made to keep all other test factors constant.

As previously stated, a test set up on this basis is one that can be relied upon to produce dependable results. But no matter how dependable or accurate the results, they are useless unless a proper interpretation of the results is made.

The fundamental problem on a tool test is to compare tool materials one with another for the purpose of selecting the best tool material. But the ratio of this difference can be misleading if not properly stated. On the lower section of Fig. 1 three curves are shown. The left-hand curve represents the average performance of the poorest tool

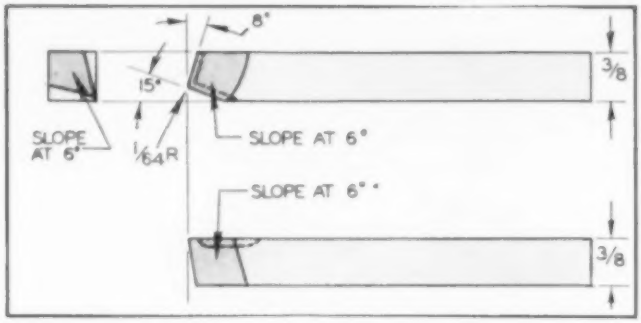


Fig. 3. This is the shape of the standardized tool which resulted from studies of tool life and performance.

material tested in a group of high speed steels. The middle curve represents a tool that has arbitrarily been selected as acceptable, that is, tools performing better than this standard are considered good tools. The right-hand curve represents the average performance of the best tool material of the group tested. Now, if we wished to make a comparison of the best tool material with the acceptable standard, we could do this at any point such as *O* on the curve of the standard material. If we wished to compare the resulting tool life of the test materials by using the percentage increase of tool life of the best material compared with the tool life of the acceptable standard as a measure of efficiency (along the line *OA*), the following would result: $\frac{60}{36} \times 100) - 100 = 62$ percent. If we wished to compare the resulting possible increase in cutting speed of the best material with the cutting speed of the acceptable standard as a measure of efficiency, the percentage increase in efficiency (along the line *OB*) would be: $\frac{75}{63} \times 100) - 100 = 19$ percent. In the same way comparing the acceptable material with the lowest rated material at *R* and *Q* on the curve, the following is noted:

| | Percent Decrease in Cutting Speed | Percent Decrease in Tool Life[1] |
|---|---|---|
| at R | 13 | 24 |
| at Q | 12 | 61 |

Note that in general the percentage change in tool life for a constant cutting speed has a greater absolute value than the percentage change in cutting speed for constant tool life. The above values do not prove the facts, but from test experience, the following is known:

a. Over the major portion of the speed range, the two curves will have a constant value of the ratio of percent change in cutting speed for constant tool life.
b. The ratio of percent change in tool life for constant cutting speed will be different at every point, and will increase as the cutting speed decreases.

It is obvious that the percent change in cutting speed is a correct measure of a cutting tool's efficiency. This is so because the actual measure of a cutting tool's efficiency is the answer to the question "How much faster can I cut with one tool compared to another for constant tool life?" However, this requires sufficient area to make the desired comparison, and this is too expensive for routine testing. The Manufacturing Laboratory method for routine tool testing is to run the test at a constant speed that has been selected as previously described, and to present the results in tool life expressed as cubic inches of metal removed. Note that although this exaggerates the actual percentage difference between materials, this exaggeration is much less

for a test speed selected as previously described than one selected at random at lower values of cutting speed, nor does it affect the relative standing of the test tools. When more exact values for research purposes are desired, the test is continued far enough to make a complete comparison of the speed-tool life curves.

The final test value is taken as the common average of five tests made from tools of the same lot of tool material under test. The question naturally arises as to how closely a random tool of this material will come to the test value. For example, the test results of two tool materials may be as follows:

| | | | |
|---|---|---|---|
| Tool A-1 | 34 | Tool B-1 | 57 |
| A-2 | 28 | B-2 | 41 |
| A-3 | 39 | B-3 | 39 |
| A-4 | 36 | B-4 | 40 |
| A-5 | 43 | B-5 | 33 |
| Average | 36 | Average | 42 |

It is entirely possible—but not probable—that in a single comparison of material A with material B, the low value of 28 for A and the high value of 57 for B would result. Both of these values would be misleading. However, if a few more comparison runs are made, the average will perform close to the average predicted by the test. To determine if the quadratic average of the test results would give a better picture, the quadratic average of a whole year's tests were calculated. This method did not change the relative standing of any of the tool materials, so the simple average is used.

Another question that might arise is how close to the average will individual tools of a material perform? For example, suppose another lot of tools were tested with the following results:

| | |
|---|---|
| C-1 | 34 |
| C-2 | 38 |
| C-3 | 35 |
| C-4 | 37 |
| C-5 | 36 |
| Average | 36 |

Obviously tool material C would be better tool material than A, although their averages were identical. Individual tools of material C could be expected to perform very close to the average value, but individual tools of material A would vary as much as 24 percent from the average. A measure of this variation would be the statistician's value of $\delta$. Calculation of this value for many tool tests reveals a considerable variation in the value of $\delta$ for various tool tests. But immediately the question arose as to what weight to give $\delta$ as compared to the average in evaluating a tool material. No satisfactory answer has been developed for this question. In practice the material is rated in accordance with the average. This is correct because the answer desired to the tool test is "How will this tool perform on the average?" Individual high or low values are soon averaged out in the shop.

The test procedure, as outlined above, has several advantages other than its use in tool evaluation. For example, the same procedure can be used for evaluating the effects of machineability, coolants, rake angles, tool design, quality of tool grind, speed, feed, and depth of cut. To make such tests as these it is only necessary to allow the quality under consideration to vary in the test as the other factors are held constant. In addition, the test results can be used for the mathematical determination of cutting formulas

# Mathematical Analysis of

# Springback Angles for Aluminum Sheets

**By Y. C. Lee**

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THESE INVESTIGATIONS WERE conducted in an effort to analyze mathematically the mechanism of springback of sheet metals. The materials under investigation were cladded 24ST and 24SO, commonly used in the aircraft industry.

The conclusions were based on a test accomplished on a universal testing machine. A steel block form was designed with varying block radii along its four edges: 1/16 in., 1/8 in., 3/16 in., and 1/4 in. respectively. Additional equipment included a welded box containing a four-inch-deep rubber pad. Shore hardness of the steel was 55-60. Fig. 1 shows the arrangement of the test. The form block was pressed down in an inverted position into the rubber pad. The rubber blanket was restricted to extrusion by the flanges of the box, and better distribution of the pressure was thus insured. The test specimens, in various thicknesses, were bent 90 deg around the four radii of the block. Pressures and springback angles are given in Table I.

## Relationship Between Block Radius and Sheet Thickness

From Table I, it can be seen that the minimum pressure necessary for the test specimens was in the neighborhood of 1000 psi for sheet thickness less than 0.025 in., 1200 psi for gages between 0.032 and 0.040 in., and 1400-1500 psi for gages over 0.051 in.

Table II is a condensation of the data in Table I. In addition to showing the springback values of 24ST and 24SO through a 90 deg bend, it indicates that the values of springback are increased when the block radius is increased, and are decreased when the sheet thickness is increased. The following relation may thus be assumed:

$$S = t^{n} \times R^{m}$$

$$\text{for 24ST} \quad S = K \times t^{n} \times R^{m} \qquad (1)$$

$$\text{for 24SO} \quad S' = K' \times t'^{n'} \times R'^{m'} \qquad (2)$$

Where S, S' = value of springback in deg
t = thickness of sheet in in.
R = block radius in in.
K, K' = constants
n, m, n' and m' exponents to be determined

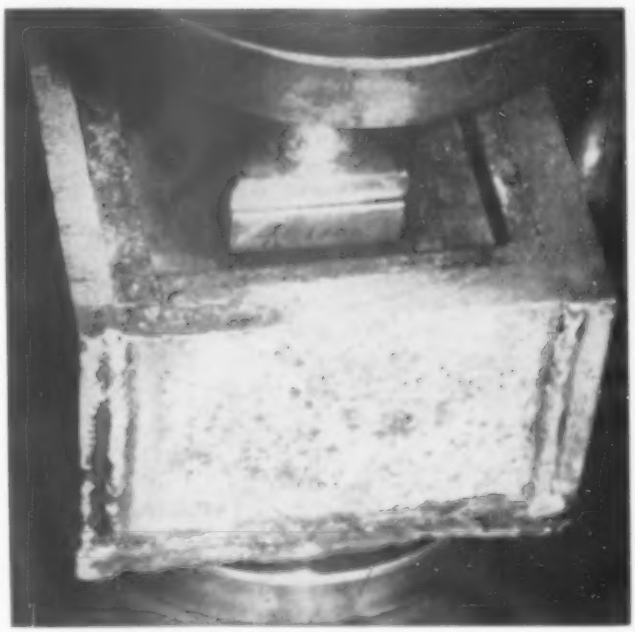

Fig. 1. General arrangement of the test is shown here. Form block was pressed down into rubber pad, which in turn was restricted in movement by flanges on the box.

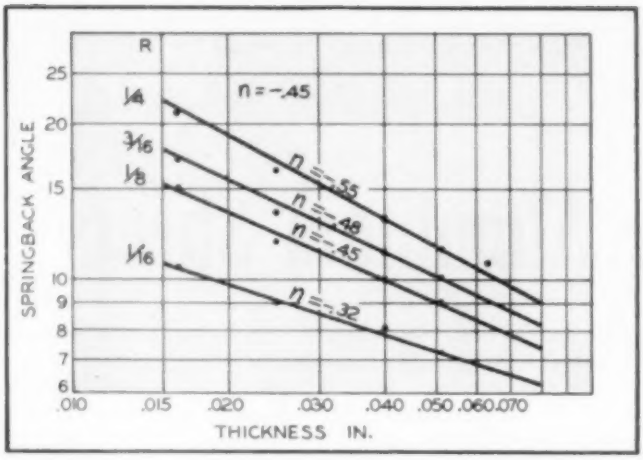


Fig. 2. Springback versus thickness for 24ST.

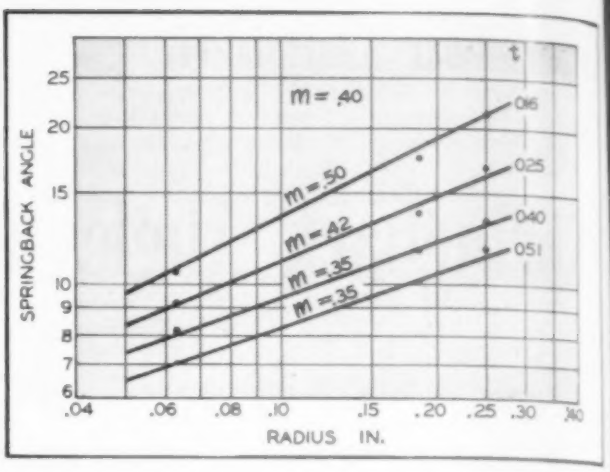


Fig. 3. Springback versus radius for 24ST.

## Determining Exponents

To aid in determining exponents n, m, n′ and m′, the values of springback have been plotted as shown in Figs. 2, 3, 4 and 5; firstly against thickness with the block radius as the constant, and secondly against the block radii with the thickness as a constant. The slopes denoted by n, m, n′, and m′ can be averaged as—0.45, 0.40,—0.73 and 0.73 respectively.

Thus equations (1) and (2) can be written as follows:

$$S = K \frac{R^{.40}}{t^{.45}} \quad (3)$$

$$S' = K' \frac{R^{.73}}{t^{.73}} \quad (4)$$

Table III was developed to determine the values K and K′. From it, the averaged values of these constants were taken to be 5.35 and 1.24. The final equation, therefore, is

**TABLE I: SPRINGBACK FOR 90 DEG. STRAIGHT FLANGES AT VARIOUS PRESSURES ON FROM BLOCK**

| MATERIAL | THICKNESS IN. | BLOCK RADIUS IN. | PRESSURE PSI 600 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 ST | 0.016 | 1/16 | 11.5 | 10.5 | 10.5 | | | | | | |
| | | 1/8 | 16 | 16 | 16 | 15 | 15 | | | | |
| | | 3/16 | 21 | 18 | 18 | 17.5 | 17.5 | | | | |
| | | 1/4 | 24.5 | 23 | 23 | 23 | 21 | 21 | | | |
| | 0.025 | 1/16 | 11 | 9 | 9 | | | | | | |
| | | 1/8 | 16.5 | 12.5 | 12.5 | 12 | 12 | | | | |
| | | 3/16 | 20.5 | 14 | 13.5 | 13.5 | 13.5 | | | | |
| | | 1/4 | 23 | 17 | 17 | 16.5 | 16.5 | 16.5 | | | |
| | 0.040 | 1/16 | 20 | 9 | 9 | 8 | 8 | | | | |
| | | 1/8 | 28.5 | 14 | 13 | 11 | 10 | 10 | | | |
| | | 3/16 | 24 | 20 | 14 | 12.5 | 11.5 | 11.5 | | | |
| | | 1/4 | 34.5 | 22 | 15 | 13.5 | 13 | 13 | | | |
| | 0.051 | 1/16 | | | 8.5* | 8* | | 7.5* | | | |
| | | 1/8 | | | 15 | 12 | 10 | 9 | | 9 | |
| | | 3/16 | | | 16 | 12.5 | 12 | 11 | | 10 | |
| | | 1/4 | | | 20 | 16.5 | 12 | 11.5 | | 11.5 | |
| | 0.064 | 1/16 | | | * | | | | | | |
| | | 1/8 | | | | 20* | 13* | | | | |
| | | 3/16 | | | | 22.5 | | 20 | 11.5* | | |
| | | 1/4 | | | | 28 | 20 | | 18 | 11 | 10.5 |
| 24 SO | 0.016 | 1/16 | 4 | 4 | 4 | | | | | | |
| | | 1/8 | 8 | 6 | 6 | | | | | | |
| | | 3/16 | 8.5 | 7.5 | 7.5 | 7.5 | | | | | |
| | | 1/4 | 10 | 10 | 9.5 | 9 | 9 | | | | |
| | 0.020 | 1/16 | 3 | 3 | 3 | | | | | | |
| | | 1/8 | 5 | | 5 | 5 | | | | | |
| | | 3/16 | 8 | 6 | 6 | 6 | | | | | |
| | | 1/4 | 8 | | 7.5 | 7 | 7 | | | | |
| | 0.032 | 1/16 | 3 | 2 | 2 | | | | | | |
| | | 1/8 | 7.5 | 4.5 | | 4 | 3.5 | | | | |
| | | 3/16 | 8 | 5 | 4.5 | 4.5 | 4.5 | | | | |
| | | 1/4 | 13 | 6 | | 5.5 | 5.5 | | | | |
| | 0.040 | 1/16 | 7.5 | 3 | | 2 | 1.5 | 1.5 | | | |
| | | 1/8 | 9 | 4 | | 3.5 | 3 | 3 | | | |
| | | 3/16 | 16 | 6 | | 4.5 | 4 | 4 | | | |
| | | 1/4 | 16.5 | 6.5 | | 5 | 4.5 | 4.5 | | | |
| | 0.51 | 1/16 | | 4 | | 2 | 1 | 1 | | | |
| | | 1/8 | | 5 | | 3.5 | | 2.5 | | 2.5 | |
| | | 3/16 | | 6 | | 4 | | 3.5 | | 3.5 | |
| | | 1/4 | | 8 | | 6.5 | | 4 | | 4 | |
| | 0.64 | 1/16 | | | | 1 | | 1 | | | |
| | | 1/8 | | | | 2 | | 2 | | | |
| | | 3/16 | | | | 4 | | 3 | | 3 | |
| | | 1/4 | | | | 4 | | 3.5 | | 3.5 | |

* Cracked

TABLE II: **SPRINGBACK VALUES FOR 90 DEG. STRAIGHT FLANGE**

| BLOCK RADIUS IN | SPRINGBACK IN DEG. | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.016" | 0.020" | 0.025" | 0.032" | 0.042" | 0.51" | 0.064" |
| 245-T Alc. | | | | | | | |
| 1/16 | 10.5 | | 9 | | 8 | c | c |
| 1/8 | 15 | | 12 | | 10 | 9 | c |
| 3/16 | 17.5 | | 13.5 | | 11.5 | 10 | c |
| 1/4 | 21 | | 16.5 | | 13 | 11.5 | 10.5 |
| 245-O Alc. | | | | | | | |
| 1/16 | 4 | 3 | | 2 | 1.5 | 1 | 1 |
| 1/8 | 6 | 5 | | 3.5 | 3 | 2.5 | 2 |
| 3/16 | 7.5 | 6 | | 4.5 | 4 | 3.5 | 3 |
| 1/4 | 9 | 7.5 | | 5.5 | 4.5 | 4 | 3.5 |

c Cracked

TABLE III: **DETERMINATION OF THE AVERAGE VALUES OF K & K'**

| THICKNESS | R 1/16 | | 1/8 | | 3/16 | | 1/4 | |
|---|---|---|---|---|---|---|---|---|
| | S | K | S | K | S | K | S | K |
| 245-T Alc. | | | | | | | | |
| .016 | 10.5 | 4.95 | 15 | 5.35 | 17.5 | 5.30 | 22 | 5.94 |
| .025 | 9.0 | 5.20 | 12 | 5.25 | 13.5 | 5.03 | 16.5 | 5.47 |
| .040 | 8 | 5.70 | 10 | 5.40 | 11.5 | 5.30 | 13 | 5.62 |
| .051 | | | 9 | 5.40 | 10 | 5.10 | 11.5 | 5.22 |
| .064 | | | | | | | 10.5 | 5.30 |
| Average | | | | | | | | 5.35 |
| | S' | K' | S' | K' | S' | K' | S' | K' |
| 245-O Alc. | | | | | | | | |
| .016 | 4 | 1.48 | 6 | 1.35 | 7.5 | 1.25 | 10 | 1.35 |
| .020 | 3 | 1.30 | 5 | 1.31 | 6 | 1.16 | 7.5 | 1.18 |
| .032 | 2 | 1.21 | 3.5 | 1.29 | 4.5 | 1.22 | 2.5 | 1.21 |
| .040 | 1.5 | 1.08 | 3 | 1.31 | 4 | 1.29 | 4.5 | 1.18 |
| .051 | 1 | .86 | 2.5 | 1.30 | 3.5 | 1.34 | 4 | 1.24 |
| .064 | 1 | 1.03 | 2 | 1.24 | 3 | 1.37 | 3.5 | 1.30 |
| Average | | | | | | | | 1.24 |

$$S = 5.35 \frac{R^{.40}}{t^{.40}} \text{ for 24ST cladded sheets} \qquad (5)$$

$$S = 1.24 \frac{R^{.73}}{t^{.73}} \text{ for 24SO cladded sheets} \qquad (6)$$

Table IV shows both the springback values experimentally determined and computed from equations (4) and (5). The computed values were closely related to the corresponding values developed by actual experimentation.

TABLE IV: **SPRINGBACK VALUES, EXPERIMENTED COMPARED TO COMPUTED**

| BLOCK RADIUS IN | SPRINGBACK, EXPERIMENTED | | | SPRINGBACK, COMPUTED | | | |
|---|---|---|---|---|---|---|---|
| | .016" | .020" | .025" | .032" | .040" | .051" | .064" |
| 24 ST | | | | | | | |
| 1/16 | 10.5/11.3 | | 9 / 9.3 | | 8 / 7.5 | c / | c / |
| 1/8 | 15 /15 | | 12 /12.2 | | 10 / 9.9 | 9 / 8.9 | c / |
| 3/16 | 17.5/17.6 | | 13.5/14.4 | | 11.5/11.6 | 10 /10.5 | c / |
| 1/4 | 21 /20 | | 16.5/16.2 | | 13 /13 | 11.5/11.8 | 10.5/10.6 |
| 24 SO | | | | | | | |
| 1/16 | 4 / 3.3 | 3 /2.9 | | 2 /2.0 | 1.5/ 1.7 | 1 / 1.4 | 1 / 1.2 |
| 1/8 | 6 / 5.5 | 5 /4.8 | | 2.5/3.4 | 3 / 2.8 | 2.5/ 2.4 | 2 / 2 |
| 3/16 | 7.5/ 7.5 | 6 /6.4 | | 4.5/4.6 | 4 / 3.8 | 3.5/ 3.2 | 3 / 2.7 |
| 1/4 | 9 / 9.2 | 7.5/7.9 | | 5.5/5.6 | 4.5/ 4.8 | 4 / 4 | 3.5/ 3.3 |

Additional work has been done by the author on this test for bend bevel angles other than 90 deg. For the same gage, bend radius and material, the magnitude of springback is approximately proportional to the amount of cold work exerted. Therefore the multiplication factor, which had been previously stated by Chapman, Hazlett and Schroeder (Product Engineering, July, 1942). The increase is given as the increase of the bend angle according to a ratio of the bend angle in deg to 90 deg.

The foregoing discussion can be concluded by an illustration. A beltframe, made of 0.016 in. 24ST alclad sheet, has a part angle of 108 deg and a bend radius of $\frac{1}{8}$ in. To find the springback angle:

From equation (5)

$$S_{90} = 5.35 \frac{(.125)^{.40}}{(.016)^{.40}} = 15.0 \text{ deg}$$

The required springback angle will be:
Here the bend angle is 180 — 108 = 72 deg

$$S_{72} = 15 \times \frac{72}{90} = 12.0 \text{ deg}$$

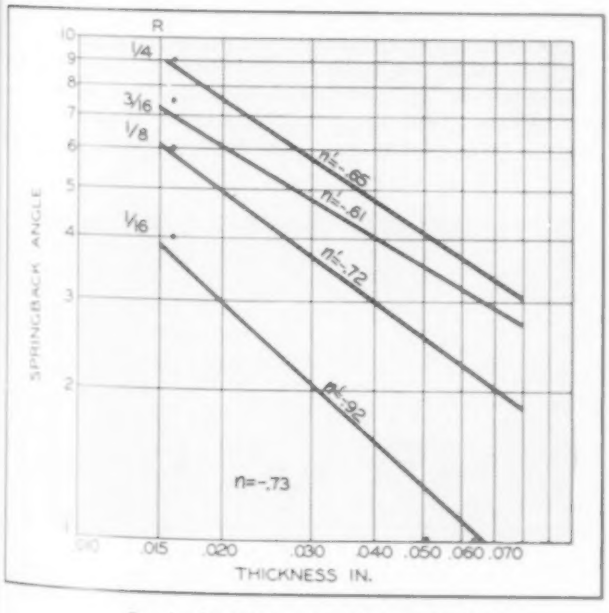


Fig. 4. Springback versus thickness for 24SO.

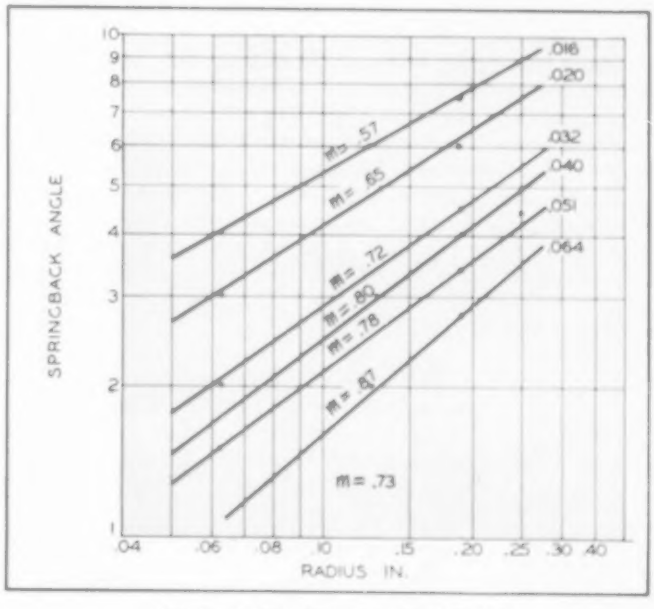


Fig. 5. Springback versus radius for 24SO

# A Metallurgical Approach to Grinding Hardened Steel

By L. P. Tarasov*

NORTON COMPANY RESEARCH LABORATORIES

EXPERIENCE HAS SHOWN that simple metallurgical techniques can often be helpful in determining the cause or causes of grinding difficulties. When metallurgical factors, such as faulty heat treatment, are involved, it may still be possible to get out of trouble by doing something about the grinding, such as decreasing the rate of cut and hence of production, or going to a softer wheel, but these may be expensive solutions. The most economical solution may easily be one requiring a change in the heat treating practice.

The tool engineer, who is naturally interested in economical production, will thus find it advantageous to make what use he can of the metallurgical approach to his grinding difficulties, both in determining their causes and, when metallurgical factors are apparently involved, in finding the proper solutions. If a plant metallurgist is available, he should be brought into the grinding picture so that his specialized knowledge of metals can be utilized. When there is no metallurgical talent in the organization, the tool engineer can pick up enough information from the published literature (1) to enable him to do considerable trouble shooting himself. Even though he does not know how to improve the heat treatment, if that is indicated, he will at least know in what direction to seek help.

The metallurgical approach to grinding is twofold. The nature and condition of the metal can affect its response to grinding. Thus, the ease of grinding tool steels depends on their composition and microstructure. Similarly, the grinding sensitivity of hardened steels, or their tendency to crack during or after grinding, is affected by the heat treatment. Conversely, the grinding operation can affect the physical and metallurgical condition of the surface of hardened steel, as when it becomes cracked or burned in grinding.

## Grindability

Let us first look briefly into the subject of grindability, a subject just beginning to be investigated. Grindability is simply the portion of machinability that has to do with grinding, and is a measure of the relative ease of grinding. Surface grinding studies of a large variety of hardened tool and die steels gave excellent correlation between wheel wear and relative ease of grinding as determined from toolroom experience.

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Wheel wear increased rapidly as the steels became more difficult to grind on the basis of general experience with total grinding costs involved in obtaining the finished product. Plain carbon tool steel and oil-hardening tool steel were the easiest to grind, resulting in the least wheel wear. The wheel wore several times as much for 18-4-1 high speed steel; several times as much again for high-carbon, high-chromium die steel; and considerably more than that for the high-vanadium high-speed steels, which are now being used more and more. For the same stock removal, the lowest grindability steel wore the wheel 200 times as much as did the highest grindability steel. Contrary to expectations, the power or energy consumed in grinding could not be related to the ease of grinding as based on practical experience.

The grindability of the "nondeforming" steels, such as the low-alloy oil-hardening and the high-carbon, high-chromium varieties, decreased rapidly with increasing chromium content. In high-speed steels, the corresponding factor was the vanadium content. Both these elements form very hard carbide particles in steel which resist the cutting action of the grinding wheel. The complex chromium-iron carbides in high-carbon, high-chromium steel are roughly 50 per cent harder than the iron carbide found in carbon tool steel or in carburized steel, while the vanadium carbide present in the high-vanadium high-speed steels is about twice as hard as iron carbide. Thus, the grindability of hardened tool steels depends to a great extent upon the nature and amount of

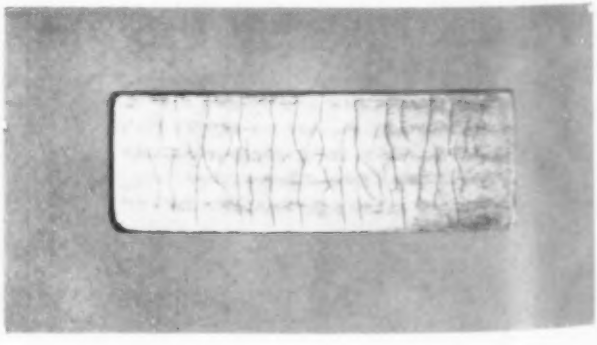

Fig. 1. Above are shown surface cracks in hardened steel which has been ground too severely. Cracks are perpendicular to the grinding direction, shown by faint burn marks.

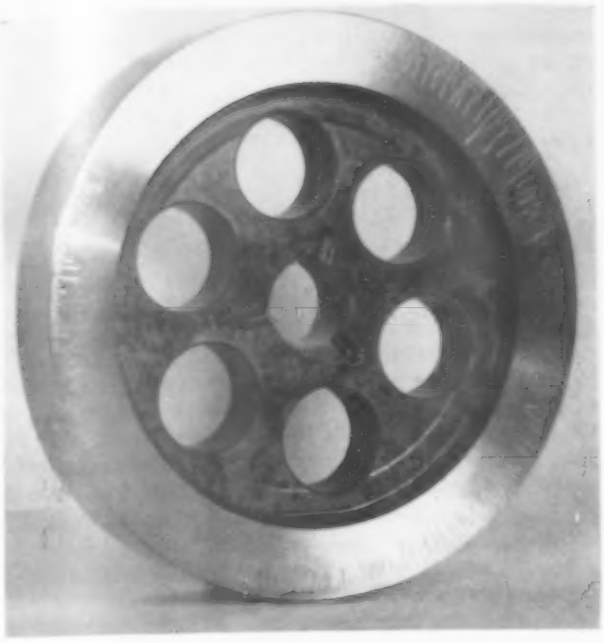

Fig. 2. Radial surface cracks, perpendicular to circular grinding marks.

carbide particles present in them. The quenching medium normally used in heat treatment has no effect by itself upon the grindability, since it is easy to find water, oil and air hardening steels having the same grindability characteristics.

From a practical standpoint, such grindability studies will make it possible to group all tool and die steels in a logical manner so that representative ones can be selected for exhaustive study to determine the most suitable grinding recommendations for each group. Any tool or die steel that has not been tested can then be placed into one of these groups from a knowledge of its composition, and the corresponding grinding recommendations will be applicable, at least as a first approximation.

## Surface Cracks

Turning now to some of the troubles encountered from time to time in the grinding of hardened steels, surface cracking is generally the most serious from the standpoint of possible service failure. These cracks, often called grinding cracks because they are associated with the grinding operation, are quite shallow, perhaps 0.010 to 0.020 in. deep, and they bear a definite relationship to the grain marks or scratches left by the abrasive grains of the wheel. They should not be confused with previously existing heat treatment cracks, which are generally deep and are related to the geometry of the piece rather than to the grinding pattern.

The surface cracks with which we shall be concerned occur during or after grinding, sometimes after a considerable delay. In flat surfaces, they are always primarily perpendicular to the grain marks, as illustrated in Figs. 1 and 2. There may also be cracks joining the perpendicular ones and forming a network, like that in Fig. 3. The same types of cracks may be found in curved surfaces, although here they may deviate more from the nominal direction, as shown in Fig. 4. Cracks parallel to the grinding direction are sometimes encountered in curved surfaces, especially when threads are ground. Occasionally, when carburized steel is ground under conditions of broad contact between wheel and work, cracks form parallel to the surface so that portions of it spall off, as in Fig. 5.

Crack patterns, such as these, in which some relationship can be observed between the crack directions and the grain marks left by the wheel, indicate nothing more than that the cracks were formed during or after grinding. The pattern does not by itself furnish any clue to the principal cause or causes of cracking. Improper grinding may be the most important factor, as it often is, or the steel may be so sensitive that the surface becomes cracked even when the grinding is extremely gentle. Cracking occurs whenever the heat generated momentarily is too great for the sensitivity of the steel. If the steel is not sensitive, then even the most abusive sort of grinding will be incapable of cracking it. The more sensitive a steel happens to be, the less grinding heat will be needed to crack it.

To eliminate such cracks in the most economical fashion, it is often desirable to know whether excessive heat or sensitivity is the primary cause of the difficulty. Studies of the burn pattern and of the microstructure may be helpful in this connection.

There are many reasons why too much heat may be generated in precision grinding. Most of them can be related either to excessive rates of stock removal or to unsatisfactory condition of the wheel face, which may in turn be due to such things as improper wheel dressing or wrong wheel selection.

If the wheel is dressed so that the abrasive grains have large flat areas in contact with the work, the ground surface will be heated more than if the wheel was properly dressed so as to leave the grains sharp. The latter can be accomplished by feeding a relatively sharp diamond at a moderately rapid rate across the wheel face and avoiding too light a cut. A wheel dressed to give a fine finish is purposely left with a comparatively dull face and it should not be used in this condition for any but very light cuts, otherwise it will develop excessive heat in the work surface.

As for correct wheel selection, too hard a wheel will soon grow dull in use since the grains are too strongly bonded to be torn out of the wheel when they should. Loading of the wheel face with particles of the work material must also be avoided since metal-to-metal contact leads to high frictional heat, and here again proper wheel selection is important.

## Grinding Sensitivity

The other major contributing factor to cracking, grinding sensitivity, is only now beginning to be slightly understood. Incompleteness of the hardening transformation has been found to be an important source of sensitivity in high-speed steels and, very recently, in SAE 52100 steel.

High-speed steels were long considered to be more difficult to grind without cracking than most other tool steels. However, when double tempering of high-speed steel became a fairly common practice during the past few years in place of the older practice of tempering only once, complaints with respect to surface cracking dropped to a negligible level. There is good reason to believe that the great de-

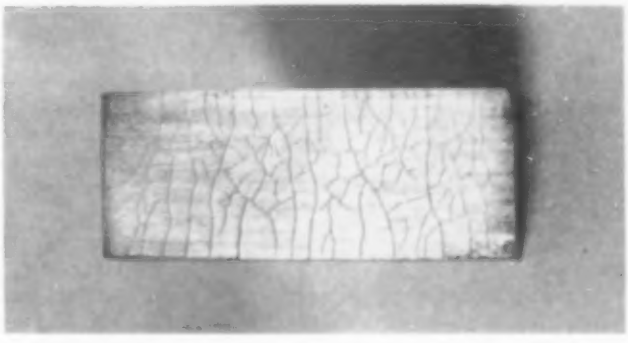

Fig. 3. A network of surface cracks is shown on this grinding specimen.

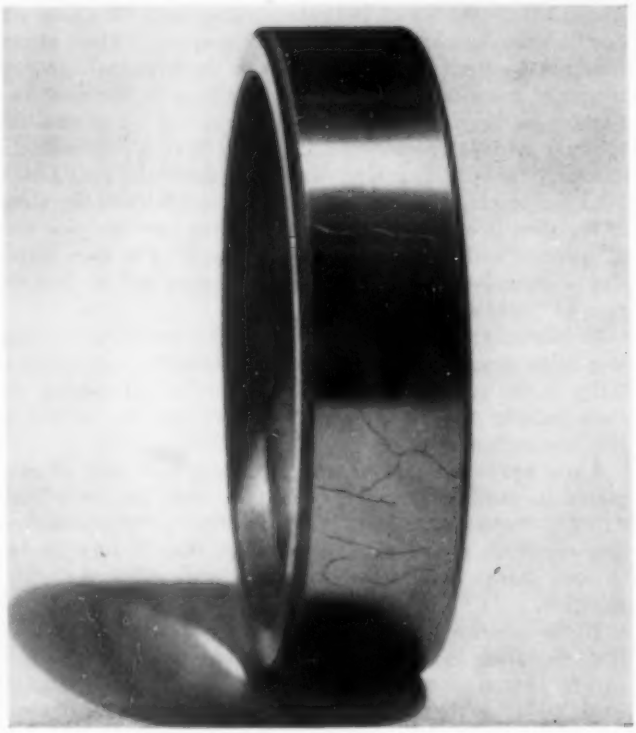

Fig. 4. Cracks in cylindrical surface, roughly perpendicular to circular grinding marks.

crease in sensitivity was due to the elimination of a brittle constituent (untempered martensite) by the second tempering operation, this brittle constituent being associated with the incompleteness of the hardening transformation in the quench. This is an excellent illustration of how it is possible to eliminate cracks resulting from the grinding operation not by grinding more carefully and at higher cost, as was formerly necessary, but by improving the heat treatment to reduce the sensitivity of the steel.

When SAE 52100 steel, widely used for ball and roller bearings, is oil quenched and tempered in accordance with standard practice, most of the steel transforms into the hardened condition, but a certain small portion of it, distributed throughout the whole mass, remains untransformed. Experiments in which the heat treatments were suitable varied have shown that the more there is of this untransformed constituent (retained austenite), the more sensitive is the steel likely to be. In actual practice, the sensitivity of SAE 52100 steel is known to vary widely from one lot to another and it is probable that this can be ascribed to variations in the response of the different lots to heat treatment, at least in so far as the amount and distribution of the undesirable retained austenite are concerned. The sensitivity of other hardenable SAE steels is undoubtedly also influenced in the same manner.

Carburized steels are the most troublesome nowadays from the standpoint of grinding sensitivity. Experience has shown repeatedly that the presence of a brittle network of iron carbide in the outermost layer of the carburized case is likely to lead to surface cracking when the hardened case is ground. Certain carburizing and heat treating conditions tend to favor the formation of this undesirable network, so that one solution of the problem is to modify these conditions in the right direction. Without going into detail, the main thing is to avoid too high a carbon content at the surface since the network will not form when this carbon content is below about 1.0 per cent. When this is not feasible, the carbide network can be removed by slowly cooling the work to leave the case soft, carefully machining or grinding off the troublesome layer (which is not nearly as likely to crack in the soft condition), and then heat treating to harden the case, following which it can be ground successfully at normal production rates.

## Crack Detection

Whatever the causes of the cracks, they are frequently so fine as to require special methods of detection. The most reliable is the magnetic particle method, exemplified by the well-known Magnaflux process. If this is not available, the cracks can often be brought out by etching the steel for perhaps 15 seconds in dilute nitric acid. A 5 per cent solution of concentrated acid in water is generally satisfactory. When the surface is washed off and dried, any acid trapped in the cracks will seep out and discolor the surface at the edges of the cracks. Aside from the discoloration of the surface, this method is nondestructive since it does not remove any appreciable thickness of metal. If the part passes inspection, it should be neutralized in a weak alkaline solution to prevent rusting.

Hot hydrochloric or sulphuric acid is sometimes misused for the detection of such cracks in steel. These acids not only widen any cracks that may already be present, and thus render them easily visible, but they are also capable of creating entirely new cracks if the surface is severely stressed in tension. It is not possible to tell whether the cracks obtained with these acids were there before etching or formed during etching on account of the stressed condition of the surface of the hardened steel. For this reason, only weak nitric acid should be used for the detection of surface cracks in hardened and ground steel.

Cracks in cemented carbides and cast tool alloys, which are nonmagnetic, can best be detected by the fluorescent penetrant method, Zyglo being the commercial version.

## Grinding Burn

If the grinding conditions are severe enough to heat the surface of a piece of steel appreciably, both visible and invisible changes may take place in the ground surface. The visible discoloration, commonly referred to as burn, results from the oxidation of the surface during momentary exposure to high temperatures. A typical burn pattern is shown in Fig. 6.

When the steel is hard, the heat causing such discoloration may be sufficient to overtemper the surface appreciably and thus soften it. Soft skin, as this is often termed in the shop, will obviously greatly shorten the life of a cutting tool if it is present in the cutting edge. In cases of severe burn,

Fig. 5. Spalling cracks in internally ground carburized sleeve.

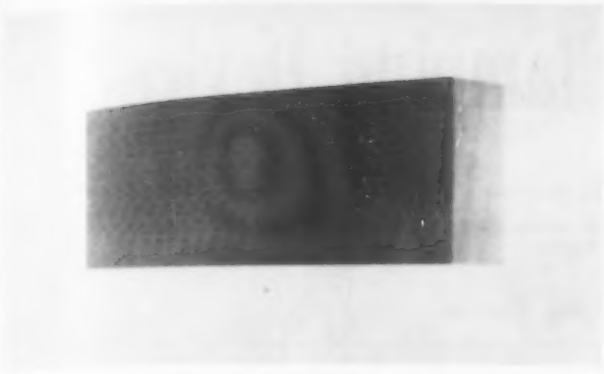

Fig. 6. Another instance of burn marks on severely ground tool steel.

parts of the surface may rise momentarily above the transformation temperature of the steel so that they reharden when they are immediately quenched by the adjacent cold steel. The rehardened spots are brittle because they are in the quenched condition, and tools or other parts in such a condition are likely to crack in service, just as though the part had not been properly tempered when it was heat treated.

In the same way, it is sometimes found that the ends of pieces cut from annealed bar stock by means of an abrasive cut-off wheel are hardened if the operation has been conducted so poorly as to result in excessive heat. Hardened ends, it is well known, lead to a great deal of trouble in subsequent machining.

It is this metallurgical burn, as these metallurgical changes may be called, and not the visible discoloration, that may be harmful to the finished part when it is placed in service. The discoloration is a danger signal, warning not only of possible metallurgical changes in the surface layers, but also that cracks may have developed. However, the fact that burn marks are visible does not necessarily mean that any of these changes have taken place.

Conversely, it often happens that a hardened steel surface has been overtempered or rehardened by excessive grinding heat, yet there are no visible burn marks because they were cleaned off as soon as they were formed or else in the finish grinding. These hidden burn effects can generally be detected by etching the ground surface directly and in a nondestructive manner. Only occasionally is it found necessary to resort to metallographic and microhardness studies to establish that the surface was burned.

## Detection of Burn

The best way to bring out a hidden burn pattern in hardened steel is to etch the suspected part for perhaps 15 seconds in a 4 per cent solution of concentrated nitric acid in water, and then the same length of time in a 2 per cent solution of concentrated hydrochloric acid in acetone, following which the part is rinsed in hot water and dried in an air blast. Overtempered areas etch dark, rehardened ones white, while any steel that has not been affected by grinding heat remains a rather light gray. An example of a burn pattern brought out in this manner is furnished by the carburized bevel gear in Fig. 7, where the thrust surface is seen to have alternate streaks of overtempering and rehardening. Had this surface not been burned as a result of faulty grinding, it would have etched a very light gray like the area near the splines.

If necessary, the acetone in the second etchant can be replaced by alcohol, although this cuts down the contrast. Some parts stain unevenly when etched but this can be overcome by a light sandblasting prior to etching. When the part is to be preserved or put into use, as is normally done if it passes inspection, any remaining acid should be neutralized with a weak alkaline solution and the part should then be dipped in a rust preventive.

High-speed steels must be etched for a longer time and in stronger nitric acid to bring out the burn pattern. Cemented carbides and cast tool alloys are not heat treatable so that even though the surface is slightly discolored, no metallurgical burn can result.

## Trouble Shooting

In trouble shooting to determine why a ground surface is cracked, it is generally necessary to etch it to see whether or not it is burned. If the cracks coincide with a pronounced burn pattern, then excessive grinding heat is the likely cause; on the other hand, if there is little evidence of burn, then the sensitivity of the steel may be responsible. Actual trouble shooting is often much more complicated than this, since so many factors may be responsible for both excessive heat and steel sensitivity. Space limitations prevent the discussion in the present article of the many factors involved.

Meanwhile, it is well to point out that the surface defects that have been discussed are injurious only if the useful service life of the part in question is adversely affected; otherwise they should be considered as nonrejectable defects. Surface cracks are generally injurious but there are occasional exceptions. Burn is frequently quite harmless unless it occurs in a cutting edge or a rubbing surface which is expected to be very hard.

Finally, the methods and principles used in trouble shooting are equally applicable to the setting up of sound inspection standards and of the most profitable production rates. The proper application of metallurgical knowledge to grinding problems will be an important way of getting greater economy in production.

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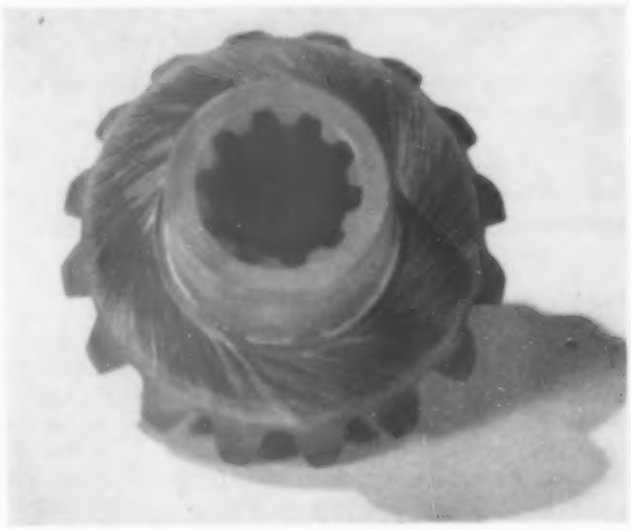

Fig. 7. Severe burn marks on the ground surface of this bevel gear are revealed by etching.

# The Mechanics of Clamping Devices

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## Part III—Spiral Cam Clamps

THE CAM IS THE BASIS for many quick acting clamping devices. The cam is in effect a wedge turned about a pivot. A gradual increase in thickness between the pivot and point of contact as the cam is rotated gives the desired action. Two forms are used, the spiral and the eccentric

### The Spiral Curve

The spiral cam is preferred because its locking action is better, although it is somewhat more expensive to make than the eccentric cam. It is based on the spiral curve of Archimedes, an example of which is shown in Fig. 1.

For the curve of Fig. 1, the radius $r$, from the origin $O$, to any point $C$, increases uniformly as a point travels on the curve around $O$. In 360 deg or $2\pi$ radians the rise is from $r_1$ to $r_2$, an amount $l$ known as the lead. At any point, the effective radius

$$r = r_1 + \frac{\Theta l}{360}, \qquad (1)$$

where $\Theta$ is given in degrees.

The normal $NC$ to the tangent $ACB$ does not coincide with the radius $OC = r$, but makes an angle $\alpha$ with $OC$. Thus, a normal reaction, such as $R_t$, on a spiral cam surface tends to set up an unlocking moment about $O$. But $R_t$ is always accompanied by a frictional force, $fR_t$, which resists the tendency to loosen the cam. As long as $\frac{fR_t}{R_t} = f$ is greater than tan $\alpha$, a spiral cam will not open.

For the Archimedes spiral, on polar coordinates,

$$r = \frac{l}{2\pi}\,\Theta$$

where $\Theta$ is the angle in radians of the radial vector $r$, from the origin of the curve. For such a curve (1),

$$\frac{dr}{d\Theta} = \frac{l}{2\pi} = r \tan \alpha = ON \qquad (2)$$

Here $ON$ is perpendicular to $OC$, and the minimum condition for a self-locking spiral cam is

$$\frac{l}{2\pi r} = f \quad \text{or} \quad r = \frac{l}{2\pi f} \qquad (3)$$

A low value of $f$ should be used, 0.1 or below, to find the minimum radius of a spiral cam. If $f = 0.1$,

$$r_1 = 1.59l, \qquad (4)$$

### Forces on a Spiral Cam

The forces acting on a spiral cam are shown in Fig. 2. These are the reaction $R_t$, from the workpiece normal to the cam surface; the friction force $fR_t$; the force $F_c$, applied to the handle; the normal force $F_s$, of the pivot pin on the cam; and its frictional force $fF_s$. Proceeding, $R_t$ and its frictional force may be combined into their resultant $R_c$; and $F_s$ its frictional force into a resultant, $F_b$ which is tangent to the friction circle having a radius which can be designated for practical purposes as $fr_s$.

The force diagram for the cam is also shown in Fig. 2. When the cam is engaged, the resultant reaction $R_s$ of the workpiece has a definite position. For a constant applied force, $F_c$, the value of $R_s$ will vary with the position of engagement. The direction of $F_c$ also will depend on the position reached by the handle. Of fundamental importance is the fact that for equilibrium $R_s$, $F_c$ and $F_b$ must always intersect at a common point, although the position of that point is different for each position of the cam and handle. When $R_s$ and $F_c$ act along parallel lines, the point of intersection is at infinity. In that position, $F_b$ is a maximum equal to $F_c + R_s$. For any position, $F_b$ may be found from the force diagram.

### Pivot Size

The pivot must be large enough so that the shearing stresses set up in it are within safe limits. The shearing stresses are caused by the reaction to the normal force $F_s$ and by torsion set up by the friction force on the pin.

The shearing stress caused by the normal force is

$$S_1 = \frac{F_s}{\pi r_s^2},$$

and the shearing stress from torsion is

$$S_2 = \frac{2fF_s}{\pi r_s^3}.$$

The maximum shearing stress is encountered where $S_1$ and $S_2$ act together and when $F_b = R_s + F_c$, and must not exceed the working shear stress $S_s$ of the material. Thus

$$S_s = S_1 + S_2 = \frac{F_s(1 + 2f)}{\pi r_s^3}$$

from which

$$r_s = \sqrt{\frac{F_s}{\pi S_s}(1 + 2f)} = \sqrt{\frac{F_b \cos T}{\pi S_s}(1 + 2f)}$$

$$= \sqrt{\frac{(R_s + F_c)\cos T}{\pi S_s}(1 + 2f)} =$$

$$\sqrt{\frac{R_t + F_c \cos T}{\pi S_s}(1 + 2f)} \qquad (5)$$

where $\tan T = f$; that is, $T$ is the angle of friction, assumed equal for both points of contact.

Since cos $T$ is always less than 1, and 0.2 is a fair value of $f$, a conservative expression for $r_s$ is

$$r_s = \sqrt{\frac{R_{t\,max} + F_{c\,max}}{S_s}} \qquad (6)$$

Where a range must be allowed for the applied force $F_c$ and the resulting workpiece reaction such that $n = \frac{F_{c\,max}}{F_{c\,min}} = \frac{R_{t\,max}}{R_{t\,min}}$, the expression for $r_s$ becomes

$$r_s = \frac{2}{3}\sqrt{\frac{n}{S_s}(F_{c\,min} + R_{t\,min})} \qquad (7)$$

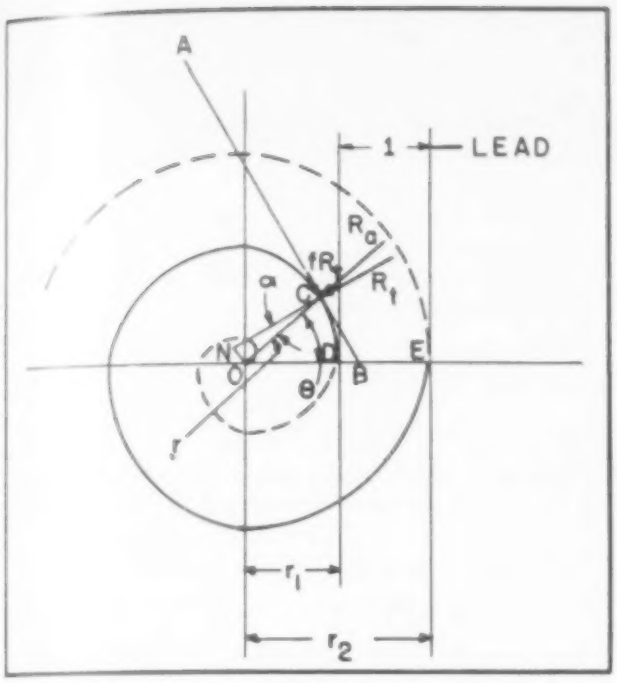


Fig. 1. The properties of a spiral curve are shown above schematically

These equations apply only where the pivot pin is projecting and is not supported at one end, and where conditions are such that bending is not an important factor. Also, the clamping torque is transmitted directly from the handle to the body of the cam clamp.

If the pivot is supported at both ends, the radius required to resist shear is

$$r_s^2 = \frac{\sqrt{2}}{3}\sqrt{\frac{R_{c\,max} + F_{c\,max}}{S_s}} \qquad (8)$$

$$= \frac{\sqrt{2}}{3}\sqrt{\frac{n}{S_s}(F_{c\,min} + R_{c\,min})} \qquad (9)$$

## The Width of the Cam Surface

The thickness of a cam determines the maximum unit stress reached in the material at the narrow band of contact on the cam surface. The cam surface and object on which it impinges may be considered a cylinder and plate. The Hertz formula (2) for the largest compressive stress from such contact is

$$S_c = 0.591\sqrt{\frac{P_l E}{d}} \qquad (10)$$

where $S_c$ = unit compressive stress, pounds per square inch.
$P_l$ = load per linear inch of contact, pounds.
$E$ = modulus of elasticity, assumed for both materials in contact.
$d$ = diameter of cylinder, inches.

This formula is based on a Poisson's ratio of 0.3. For a cam the relationship may be expressed in the form of

$$t = \frac{1.1}{k}\,\frac{R_c}{r_1} \qquad (11)$$

where $t$ = thickness of cam, equal to length of contact, inches.
$R_c$ = reaction on cam, pounds. (1.1 $R_c$ assumed equal to $R_s$ for worst conditions).
$r_1$ = smallest radius of cam surface, inches.
$k$ is a constant in pounds per inch of radius per inch of length = $\dfrac{S_c^2}{5.23 \times 10^4}$ (12)

Thus, both the thickness and radius must be suitably proportioned to withstand a specific load.

Since a cam is subjected to repeated loads, the largest unit compressive endurance limit for the material. Values of this limit and $k$ derived from it are for steel of various hardnesses in Table I.

## The Length of the Pivot Pin

The thickness of the cam also determines partly the load of the pivot or shaft on which the cam is mounted. If the cam rotates on the pivot, as in Fig. 2, the projected area (length X diameter) of the bearing must be large enough to keep the unit pressure on it below 3000 to 4000 psi in keeping with accepted practice for bearings for slow speed and intermittent loads (3).

## The Length of the Cam Handle

The lever arm $L$, of Fig. 2 and the applied force $F_c$, make the applied torque, which is

$$F_c L = aR_c + bfR_c + fr_s F_c$$

But, $a$ can be approximated by $l/2\pi$ and $b$ by $r$, so that for practical purposes

$$L = \frac{R_c\,(l/2\pi + rf) + rf_s F_c}{F_c} \qquad (13)$$

*Example 1:* A spiral cam clamp like that of Fig. 2 must impose a force of 900 pounds on the workpiece. The handle can be pulled through 90 deg with a minimum force of 30 pounds, which at times may be as high as 90 pounds. The desired rise is $\frac{1}{8}$ inch. A shearing stress of 10,000 psi in the pin is acceptable. The cam is of steel to be hardened to 400 Bhn. Find the size of the pin, the minimum radius, lead, and thickness of the cam, and the lever arm needed.

For the diameter of the pin,

$$r_s = \frac{2}{3}\sqrt{\frac{3}{10000}\,(30 + 900)} = .35 \text{ inches.}$$

Choose $\frac{3}{4}$ inch diameter, or $\frac{3}{8}$ radius for pin. For the lead of the cam,

$$r - r_1 = \frac{1}{8} = \frac{90 \times l}{360}$$

$$l = \tfrac{1}{2} \text{ inch.}$$

The possibility of a low coefficient of friction must be considered for cam locking. Thus, for $f = 0.1$, $r_1 = 1.59 \times \frac{1}{2} = 0.80$ inch, the minimum radius of the cam for locking. Choose a minimum radius of $\frac{7}{8}$ inch.

The maximum reaction may be 2700 pounds when

$F_{c\,max}$ 90 pounds

If $F_{c\,max} = R_s + F_c$,

$$F_{c\,max} = \frac{2700}{\cos T} + 90$$

for f = .158, T = 90°, and cos T = .988. For that condition

$$F_{c\,max} = \frac{2700}{.988} + 90 = 2830 \text{ pounds.}$$

**TABLE I—VALUES OF COMPRESSIVE ENDURANCE LIMIT ($S_c$), AND OF k FOR STEEL OF VARIOUS HARDNESSES**

| B.H.N. | $(S_c)_e$ | k |
|---|---|---|
| 150 | 50,000 | 480 |
| 200 | 70,000 | 940 |
| 250 | 90,000 | 1550 |
| 300 | 110,000 | 2310 |
| 350 | 130,000 | 3230 |
| 400 | 170,000 | 5530 |
| 500 | 190,000 | 6900 |
| 600 | 230,000 | 10100 |

$(S_c)_e$ reported by Spotts, M.F., Design of Machine Elements page 228. New York: Prentice-Hall, Inc., 1948.
k calculated for given values of $(S_c)_e$ by equation (12).

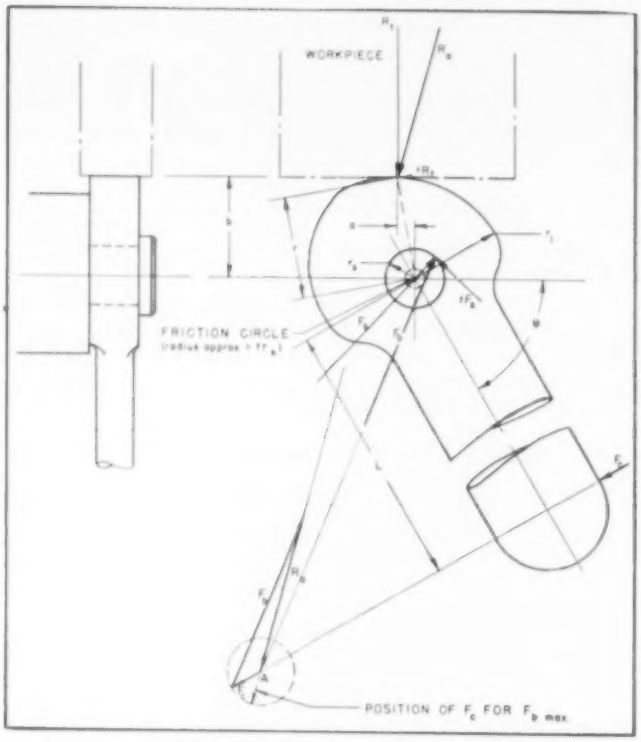


Fig. 2. Illustrated above are the forces which act on a spiral cam at engagement.

If the bearing pressure is to be kept to 3000 psi, the thickness of the cam at the pin must be

$$t = \frac{2830}{3000} \times \frac{4}{3} = 1.26 \text{ inch.}$$

Choose a length of 1¼ inches for the pin bearing. By equation (11)

$$r_t = \frac{1.1 \times 2700}{5530 \times 1.25} = 0.43 \text{ inch,}$$

so that the minimum radius of ⅞ inch for locking should be ample to withstand the compressive stress.

For the length of lever arm,

$$L = \frac{900\ (\tfrac{1}{4}\pi + .15) + .15 \times (\tfrac{3}{8})\ F_b}{30}$$

for which $r$ is taken at the maximum of 1 inch and $f$ is assumed to be 0.15. In the 90 deg position, $F_b$ is practically equal to $R_t = 900$ pounds.

$$\text{Thus } L = \frac{900}{30}\ (.08 + .15 + .06) = 30 \times .29 = 8.7 \text{ in.}$$

If the handle were made exactly 8.7 inches long, the center of the operator's grasp would probably fall below the desired lever arm. A total handle length from the center of rotation of 9½ to 10 inches is, therefore, indicated.

The coefficient of friction selected for this case is moderate but not unreasonable if the surfaces are fairly well lubricated. If it were expected that the clamp would be operated entirely dry, a higher coefficient would be in order, as high as 0.20 to 0.30.

*Example 2:* A spiral cam clamp with a lead of ½ inch and a locking angle of 72 deg is to be actuated by a 4 inch inside diameter air cylinder. The normal air pressure is 60 psi, but may rise to 90 psi. The piston rod is 1 inch in diameter and the clamping force is to be applied from the rod side of the piston. The normal force to be imposed by the cam is 3000 pounds. Specify the radius of the cam shaft, supported on both sides of the cam and capable of withstanding a working shear stress of 5,000 psi. The clamping force is to be applied directly to the cam between the shaft bearings and act at right angles to $R_t$ in the fully clamped position. Fo the minimum radius $r_t$ and thickness $t$ of the cam and le lever arm $L$ at which the clamping force should be appl to the cam.

The working area of the piston is

$$A_w = \pi(4 - 1) = 11.79 \text{ square inches.}$$

The normal clamping force

$$F_c = 11.79 \times 60 = 707.4 \text{ pounds}$$

The maximum clamping force

$F_c$ max $= 707.4 \times 1.5 = 1060$ pounds.

For the size of the shaft,

$$r_s = \frac{\sqrt{2}}{3}\sqrt{\frac{n}{S_s}(F_c + R_t)}$$

$$= \frac{\sqrt{2}}{3}\sqrt{\frac{3(707 + 3000)}{2 \times 5000}} = .495 \text{ inch.}$$

Choose ½ inch radius, 1 inch diameter for shaft.

If $f = 0.1$, the minimum radius of the cam for locking is

$$r_t = 1.59 \times \tfrac{1}{2} = .80 \text{ inch.}$$

For steel of 400 Bhn hardness, $k = 5530$

$$r_t = \frac{4500}{5530} \times 1.1 = .895$$

If $r_t$ is made 13/16 inch, $t$ must be 1.1 inch.

To find the radius at which the applied force must act

$$L = \frac{3000\ (\tfrac{1}{4}\pi + .82 \times .15) + .15 \times \tfrac{1}{2} \times F_b}{707.4}$$

when $F_c$ acts at 90 deg to the line of action of $R_t$.

$$F_b = \sqrt{R_t^2 + (F_c + fR_t)^2} =$$

$$\sqrt{(3000)^2 + (707.4 + .15 \times 3000)^2}$$

$$= 3220 \text{ pounds,}$$

and

$$L = \frac{3000 \times .207 + 3220 \times .07}{707.4} = 1.2 \text{ inch.}$$

The clamping force from the cylinder should be applied a a lever arm of 1¼ inches.

## Summary

An efficient cam for clamping has the form of a section of the spiral of Archimedes. The smallest radius that such a cam may have and still be self-locking is determined by the lead of the cam and the coefficient of friction, as expressed in equation (2).

Three principle forces act on a cam clamp. They are the reaction to the clamping force, the actuating force, and the resultant of the bearing forces. The last may be ascertained from its relationship to the others in equilibrium.

The pivot diameter for a cam must be large enough to resist shear, but no larger than necessary to keep frictional torque at a minimum. Practical radii for pivots are given by equations (6), (7), (8), and (9).

A cam must be wide enough so that surface stresses do not exceed the compressive endurance limit of the material.

The length of the bearing of a cam shaft must be enough to keep the unit pressure on the projected area within workable limits.

A cam handle must be long enough to give a torque from the force applied to it to counteract the torques set up by the reaction to the clamping force and friction forces.

In the next section a comparative analysis of the eccentric type of clamp will be made. The toggle will also be analyzed.

### References

1. **John F. Randolph and Mac Kac, *Analytical Geometry and Calculus*, page 424. New York: MacMillan and Co., 1946.**
2. **R. J. Roark, *Formulas for Stress and Strain*, page 244. New York: McGraw-Hill Book Co., Inc., 1938.**
3. **E. Oberg and F. D. Jones, *Machinery's Handbook*, page 523. New York: The Industrial Press, 1946.**

# Grinding Cam Track in Chain Cam and Gear

By Elmer B. Benson

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GRINDING THE CAM path of a hardened chain cam and gear at the Rock Island Arsenal, Rock Island, Ill., entailed not only some ingenuity in the way of simplifying the operation, but also in adapting equipment to the work. The part —shown in Fig. 1—is a steel forging and, when finished, the cam track or channel is to be $\frac{7}{8}$ in. deep and $1.500 + 0.001$ in. wide throughout. Angular spacing of cam rise and fall are to be maintained radially, with relation to the center of the gear, to a tolerance of $\pm$ 0.004 in.

It was decided that both sides of the track should be ground simultaneously, finishing with a grinding operation on the bottom as a final pass but in the same setup. Two grinding operations are necessary. The first, roughing, uses a wheel 0.006 in. smaller than the finish grind diameter. The finish grind removes about 0.003 in. of stock.

The general scheme for production grinding the cam track can be visualized from Fig. 2. A master cam *A*, attached to the work head, actuates a follower roll *B*. The latter, mounted on a swinging spindle head, in turn controls and determines the path that the grinding wheel *C* shall take in grinding the cam path on the component, which is located and clamped to the front of the master cam *A*.

Since the normal speed of the work head was too great in view of the convolutions of the cam path, a set of speed reduction pulleys were developed, which provide a speed of 8 rpm.

A special fixture for holding the follower roll *B* in a definite and fixed relation to the grinding wheel *C* was designed and made. It was to the swinging spindle head *D* in such manner that gravity pressure would always cause the follower roll to bear and roll on the master cam. Because of its fixed relation to the follower roll, the grinding wheel must take a path similar to the outside contour of the master template.

To maintain accurate distance between the centerline of the follower roll and the center line of the grinding wheel, the part of the fixture to which the follower roll is attached was made adjustable. Sliding on gibs, this part can be unloosened and moved in or out by a knob, designated by letter *B* in Fig. 2. A dial indicator, fastened to a V-block, is used for setting and checking center-to-center distance. For the final grind, the grinding wheel must be an exact diameter, as indicated by Fig. 3. To insure the required accuracy, a fixture was designed to hold the diamond dressing tool and to control the feed thereof. This fixture—designated by *F*, Fig. 2—was attached to the spindle head.

An interesting problem in connection with the project was the generation of the master cam. It was first roughed on the jig borer and then mounted on the work head of the grinder. Positioned in front of it, and locked in regular grinding position, was an accurately made sample chain cam and gear.

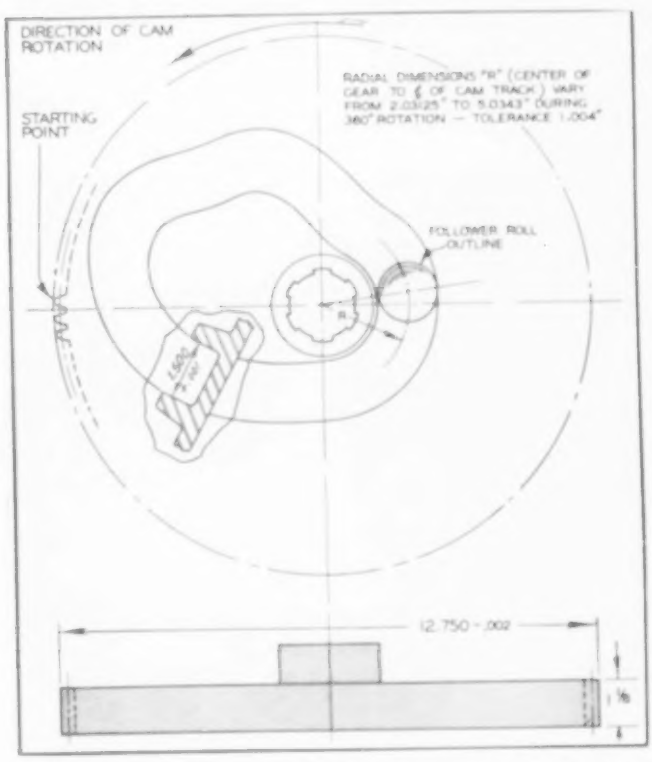


Fig. 1. Outline of chain cam and gear, showing the cam track. This chain cam gear, which is a part for one of the gun mounts used by the Navy, actuates the tray and ramming mechanism.

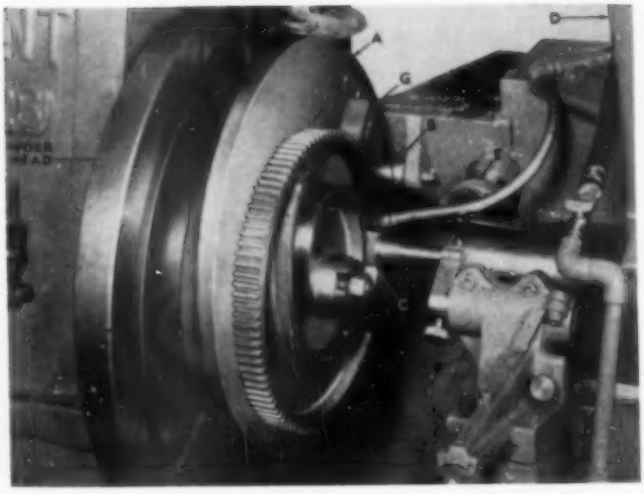


Fig. 2. Close-up of the setup showing chain cam and gear in position for cam grinding operation. Letters A, B, C, D, E, F and G indicate respectively master cam, follower roll, grinding wheel, swinging spindle head, adjusting knob for follower roll, diamond wheel dressing fixture and locating block for angular location.

The master cam was then ground by reversing the scheme previously described for production grinding; a follower roll and a grinding wheel were positioned to produce a reverse action. A grinder with a 1½ in. diameter grinding wheel—or same diameter as the follower roll—was mounted to the swinging spindle so that it would occupy a position identical to the follower roll *B* previously assigned for finish grinding.

An arbor was made and inserted in place of the grinding spindle, at the end of which was a free-rolling follower 1½ in. in diameter. Free to roll and move in the cam path as the component slowly rotated, this follower now governed the swinging spindle head so that the grinding wheel would finish grind the correct contour on the master cam. A locating block on the master cam, designated by *G*, Fig. 2, engaged gear teeth at a marked point on the component (Fig. 1). This assured correct positioning of the chain cam and gear when mounted.

## Final Inspection

Since the finished cam track must be accurate within 0.004 in. of the radial dimensions in relation to its center line,

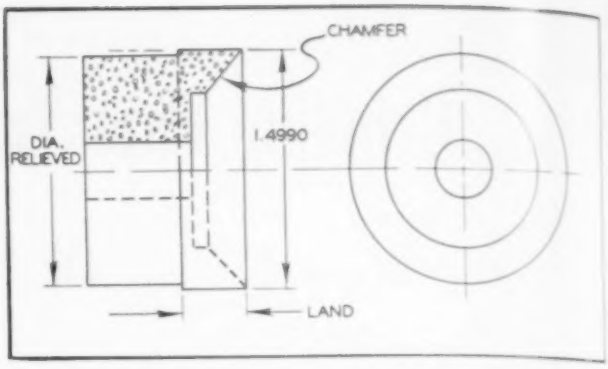


Fig. 3 shows a standard grinding wheel dressed, relieved and chamfered to permit straight side grinding of the cam track.

and given at angular intervals about the central point, position for inspection therefore corresponds to the setup for grinding. In mounting the part for inspection on the checking fixture shown in Fig. 4, the part is positioned in angular relation to the gear teeth with a locating block exactly similar to block *G*, Fig. 2. Arm *A*, which holds the follower roll in the cam track, is free to slide horizontally in the block *B* and also over the central gaging pin as radial dimensions vary during the 360 angular rotation of the part. As the fixture table is progressively indexed to the corresponding angular stations, the radial measurements may be taken with a micrometer as illustrated. The overall rise and fall of the track ranges from 2 to 5 in. in the 360 degrees. To date less than 2 percent of these parts, ground by the method described, have been rejected.

A similar application of this technique is shown in Fig. 5 where the setup is almost identical except that the parts to be ground are much smaller. Since in this case, the radial cam dimensions vary only from 1$^{15}/_{16}$ to 2½ in., a desirable sliding cross movement was made available by removing the cross-feed and replacing it with a tension spring so that the follower roll—not shown behind the grinding wheel—would constantly bear against the master cam.

In order to insure a free sliding cross movement, against spring tension, to correspond with the radial dimensions of the master cam, the weight of the spindle head was partially relieved by fastening a cable to the top of the spindle head through a pulley in the ceiling and counterbalancing it.

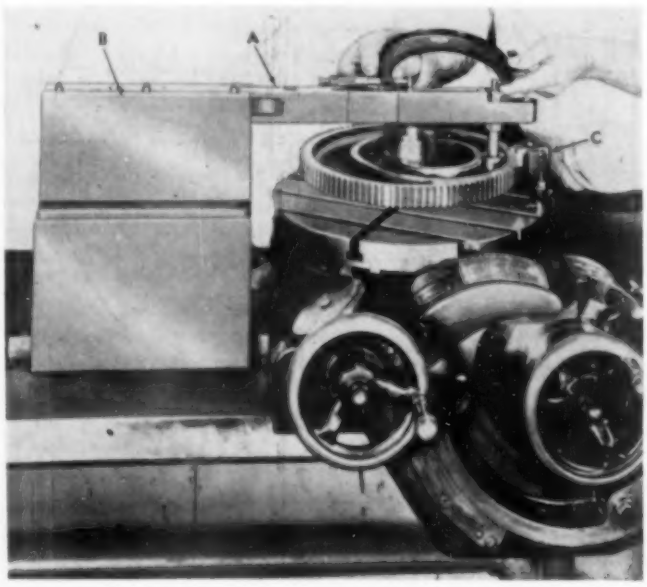


Fig. 4. Inspection gage for checking cam path. Follower roll in bar A, which in turn slides in block B, follows track, and rise and fall is measured between roll stud and center pin as shown. Part is located by means of block C.

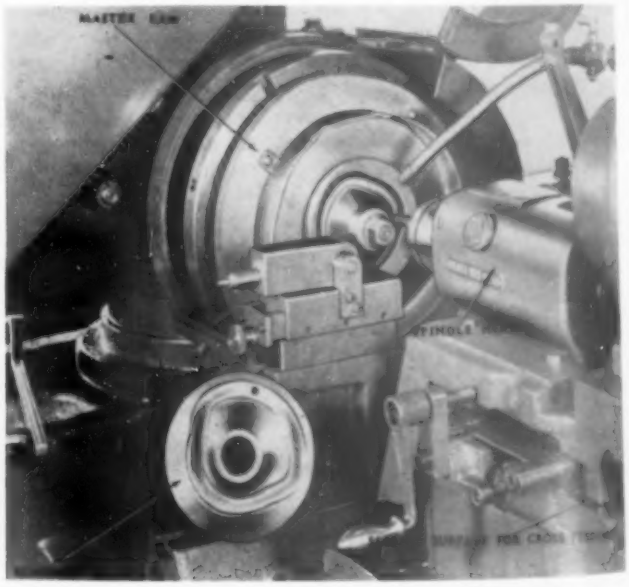

Fig. 5. Above is shown the setup in an internal grinder for grinding the smaller cams. Only slight modifications are needed in the job setup to permit extending the technique to other applications such as this.

# Getting Longer Life From Punches

**By O. W. Winter**

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One of the most important causes of punch failure are fractures occurring at the point diameter of the punch, usually in the section where the point diameter begins to taper into the shank diameter. Photoelastic studies have proven the concentration of stresses at this point. High speed micro movies have also shown a series of vibrations as the punch contacts the metal being pierced. These vibrations, and others created when the slug begins to break and still others occurring when the punch is withdrawn, are the basic cause of inter-crystalline separation beginning at the point of highest stress concentration. Such concentration usually occurs where there is a change of section or mass or where an otherwise smooth surface is interrupted by a scratch or minute surface imperfections from machining or grinding.

As the punch dulls, these vibration effects are accentuated, and in addition the compressive stress on the punch is increased. The reduction of clearance between punch and die, a common remedy for reducing slug kick back or to produce straight sided holes with 100 percent shear (as opposed to the usual hole produced by 1/3 shear and 2/3 break) result in much higher stress concentrations on the punch. A 50 percent reduction in clearance can double the stress.

Higher press speeds that provide not only more production but other desirable results in piercing operations also throw a greater stress on the punch.

The shearing stress increases in approximate direct proportion to the stock thickness up to a ratio of stock thickness near one half the punch diameter. Beyond this there is an acceleration of sizable amount depending on the material characteristics and hardness as well as on punch and die clearance.

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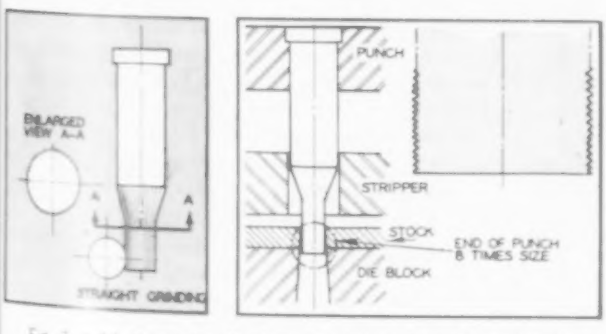



Fig. 1 (left) shows the direction of grinding lines on a straight ground punch, as opposed to cylindrical grinding (Fig. 2, right).

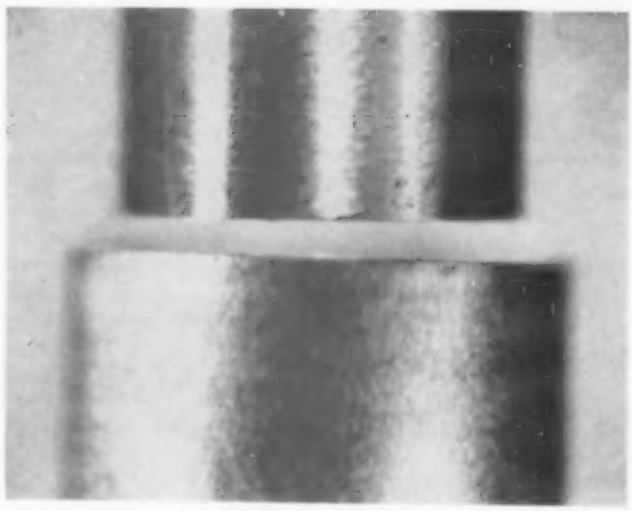
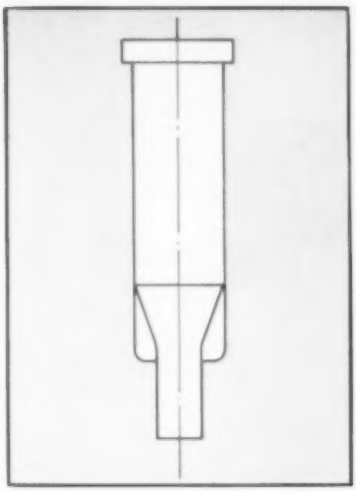
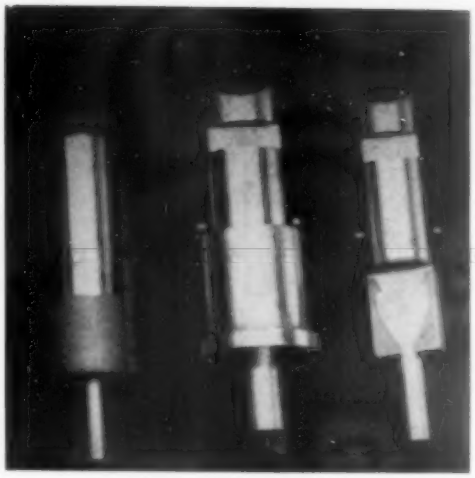


Fig. 3 The contrast between straight grinding (punch at bottom) and cylindrical grinding is shown in the micro-photo above.





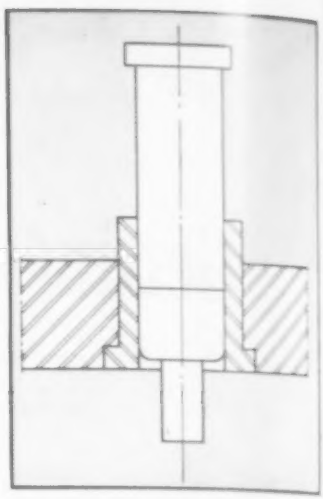


Fig. 4 (left) illustrates general location and design of whipsleeve. Some modifications of this are shown in Fig. 5 (center). The stripper bushing over the whipsleeve shown at center in Fig. 5 is also shown diagramatically in Fig. 6 (right).

Punches with certain engineered characteristics, however, are piercing stock thickness up to three times punch diameter, and frequently with straight side holes, in one operation. These same characteristics in a punch are found to consistently produce from five to ten times the number of holes per grind.

Utilization of the proper high speed steel, properly heat treated and ground is a vital factor in obtaining higher production at lower cost with longer punch life. The chromium and tungsten carbides in the structure of this steel provide definitely higher abrasion resistance while offering greater toughness and resiliency than ordinary tool steels.

## Straight Grinding

Elimination of the weakening effect of machining and grinding surface imperfections is equally important. The point diameter should be ground concentric with the shank diameter for accurate alignment, and in such a manner that the surface imperfections run parallel to the punch axis and the line of action (see Fig. 1) rather than at right angles as would be the case if the point diameter were merely cylindrical ground (see Fig. 2). This can be seen in the binocular micro-photo shown in Fig. 3 of a straight ground and a cylindrical ground punch.

The surface condition at the cutting edge of the punch is a significant consideration in evaluating the difference in performance between the two types of grinds. Studies indicate that after a punch has been used for a short while the cylindrically ground punch chips and turns over at the edge earlier than does the straight ground punch. This can again be seen in Figs. 1 and 2. Punches do not differ from other cutting tools wherein it has been proven that honing or stoning the cutting edge to provide a more uniform surface increases the tool life between grinds. In a cylindrically ground punch this is not possible, while on the straight ground punch the hills and valleys of the surface run lengthwise and therefore provide full backing and a multiple cutting tooth action that in itself greatly increases the life of the punch between grinds.

An added advantage of straight grinding is the reduction of galling. This is attributed to the combination of the multiple cutting tooth action, elimination of the screw thread similarity of cylindrical grinding plus the lubrication-retaining characteristics of the straight grind. It is significant to note that the use of a relatively coarse wheel for straight grinding gives a longer punch life than if a fine wheel is used. This is further evidence of the value of the multiple cutting tooth action.

## Whipsleeve Design

In dampening vibration and reducing punch misalignment the whipsleeve is an important factor. This sleeve, made of a vibration dampening bearing alloy, is pressure cast around the fracture section, and also serves to guide the punch for certain applications. Design and location of the whipsleeve are shown in Fig. 4, and Fig. 5 shows some variations of this. The standard jig bushing fitted over the whipsleeve to guide the punch, shown at center in Fig. 5, is also shown in diagrammatic form in Fig. 6.

Guiding a punch in the stripper is not new in die construction. Not generally recognized, however, are the many worthwhile benefits which offset the extra cost of the die.

Fig. 7 shows a typical stationary stripper die, in this case a progressive type. Punch *A* is a straight ground high speed steel pilot punch. The long wearing advantages of high speed steel and straight grinding are important on pilot punches where accuracy and close fitting are desired. Punch *B* is a whipsleeve type guided in the stripper for punching the small hole. Punch *C* is a plain but straight ground high speed steel punch for punching the large hole. In this illustration all punches are guided in the stripper without bushings as an example of inexpensive construction or where close spacing prevents the use of bushings in the stripper.

A typical progressive die with a guided spring stripper is shown in Fig. 8. Note that punches are guided in jig bushings mounted in the stripper. The stripper is given extra alignment and support by guide posts (never less than two in number) that tie in the stripper with the top and bottom shoe. This additional alignment is well worth its cost wherever punches are guided in a spring stripper. Don't rely on stripper bolts alone.

It will be noted that punch guiding is done on the whipsleeve proper and not on the point diameter. Experience has shown that there is a definite swelling on the point diameter resulting from the compression of the punch material. This is sufficient over a period to tighten the fit in the point diameter guide and cause it to freeze or gall and perhaps ruin the guide and punch. Such punch expansion is not uncommon and is a major contributing factor to the deficiencies of quill type punches, in addition to their inherent lack of rigidity and vibration-absorbing shank.

Where thin stock is being punched a two-step bushing sometimes is used to guide the punch. In such a case the punch still bears on the whipsleeve. The smaller diameter of the bushing fits closely around the point diameter to prevent dimpling of the stock but does not contact the punch.

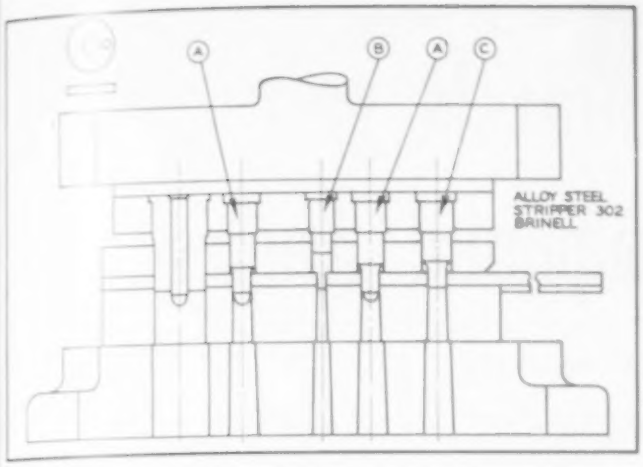



Fig. 7. Use of whipsleeve punches on a typical stationary stripper die.

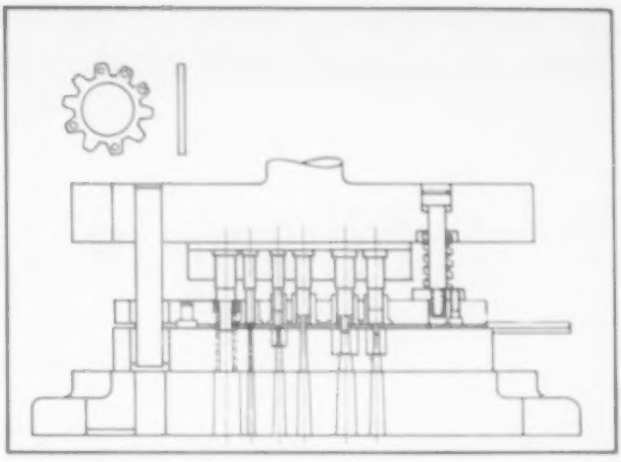


Fig. 8. Typical progressive perforating, coin chamfer and blanking die with guided pressure stripper.

diameter. However, in most cases the straight grind alone is sufficient to eliminate dimpling.

In ordinary applications guiding the punch is not necessary and even though not guided the whipsleeve plays an important role in increasing punch life. On high production or on precise jobs, however, it is worthwhile. Similarly when punching on an angle or in heavy punching operations where stock distortion results, guiding the punch in the stripper is good die design. The same is true when stock thickness exceeds one-half the punch diameter.

It must also be remembered that a die set will not correct a loose press ram. Consequently whatever added alignment is provided for the punch is helpful.

Summing up, the following points are worthwhile in securing maximum punch performance:

1. Provide depth stop so that punches cannot be set too deep.
2. Do not guide whipsleeve with guide bushings any tighter than is necessary.
3. Make critical punches shortest on point length for added strength.
4. Provide taper slug clearance in die shoe.
5. Provide taper on die sections or die buttons all the way through.
6. Use maximum punch and die clearance wherever possible.
7. Be sure whipsleeve is engaged in guide bushing before a punch contact; material to be punched.
8. When stripper itself is to be used as guide for punches instead of guide bushings, use 4140 steel or equivalent, hardness approximately 300 Bhn, heat treated before machining.
9. Use largest practical size shank possible in relation to point diameter.
10. Consider hardness of material to be punched, as well as thickness, in relation to punch diameter.

In determining the maximum stress to which such punches may be subjected some unprecedented high values are attained as may well be expected. Generally speaking the shear pressure should not exceed 2/3 of the compressive strength of the punch. This has on occasion been exceeded where requirements were severe but it is not recommended for general practice.

The formulas are as follows for shear pressure:

P = $\pi$ D T x .8S

Where

P = Shear pressure

D = Hole diameter
T = Stock thickness
S = Tensile strength of material

For compressive strength of punch

C = $\pi$ $R^2$ x 405,250

Where

C = Compressive strength of punch
R = Radius of punch

Following are some examples taken from random which illustrate the application of these principles in practice. In one case, involving a part with three $^3/_8$ in. Class 2 threaded holes, the holes formerly were drilled 5/16 in. through the $^3/_8$ in. thick carbon steel part. Presently they are being punched for the former cost of burring. The holes are straight 100 percent shear, and are produced without burr. The punches are producing 100,000 parts per grind consistently.

In another job two 0.5 in. holes are punched simultaneously in 0.5 in. cold rolled stock. The holes must be 100 percent shear without burr to properly fit pins that are later pressed in. Production per grind is in excess of 50,000 pieces.

The part shown in Fig. 7 is an interesting job. In this case the small hole is not pierced through. A 0.033 in. diameter punch is pushed 0.060 in. into the 0.103 in. thick 1020 hot rolled steel stock, pushing a slug into a 0.054 in. die and stopping the stroke with stop blocks on the die. The requirements are an accurate dowel pin accurately spaced from the center hole of the piece. The pilot punch fits the center hole tightly and the straight grind eliminates spalling at that point. The small punch runs on an average 60,000 pieces per grind and the part is being produced at a small fraction of the cost of the former method of drilling, reaming and pressing in a small dowel pin, a method which had never given fully satisfactory results.

At a large refrigerator plant a small $^1/_2$ in. diameter, 0.035 in. thick conical washer requires a 0.029 in. hole $^1/_8$ in. from the center. Formerly one girl produced 5000 parts per 40 hour week drilling and burring. The average life of the drill was 150 pieces before it broke trying to drill through the angular surface. Now a three stage progressive die with whipsleeve punches produces 5000 pieces every 2 minutes and die life is over 50,000 pieces per punch.

The Quality Hardware and Machine Div. of Continental Copper and Steel Industries, Inc., in Chicago, reports 100,000 pieces per grind piercing four 0.270 in. holes in 0.250 hot rolled steel in a progressive pierce, countersink and cutoff die where 11,857 holes was the record before whipsleeve punches were applied.

# Drilling of Compound Angles

By Tom B. Linton

PRESIDENT
KARTRON, INC.

Is this job as involved as indicated? From data and views given it appears that the solution need go no farther than to set up the 11 deg and 27 deg angles, then proceed to drill. See Fig. 1.

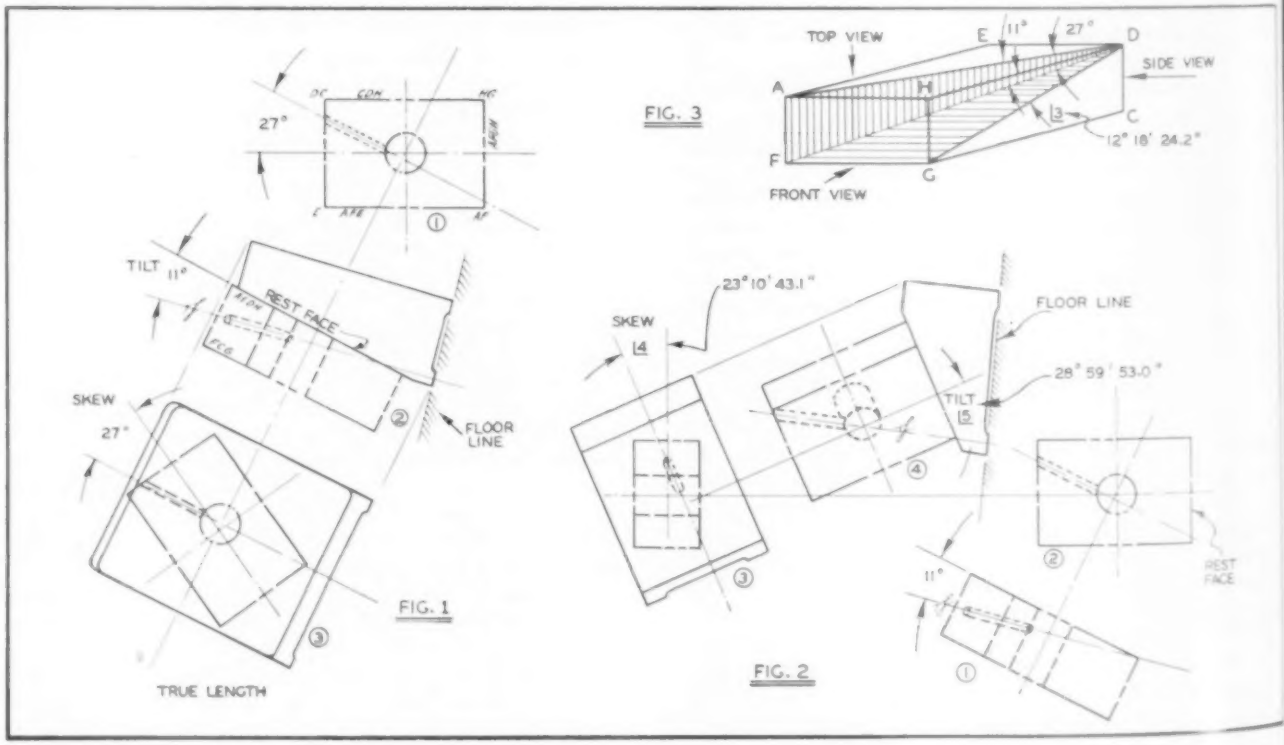
Assumption is made the part may rest on that surface which is at 11 deg to the drilled hole, and which is partially shown as an edge view in the article's auxiliary section. Clarity of analysis may be gained by adding another view—the mirror opposite of the plan section shown in the article's upper view.

**NOTE: This is a reopening of the compound angle problem first presented in *The Tool Engineer* for January, 1949. The author's notes offer another approach to the problem.**

If, however, the rest face is as indicated in the enclosed Fig. 2, then Fig. 2 shows the tilt and skew angles with the conventional projections for that case.

In regard to the original article, step 2 seems to be in error in that angle *ADF* is 11 deg, not *HDG* as shown. Referring to Fig. 3, plane *DEFG* is at a greater angle to plane *AEDH* than 11 deg, because *AF* *HG* and *AD* *HD;* angle *HDG* is 12 deg 18 ft 24.2 in.

I venture the opinion that pictorial approaches as indicated in the article are quite difficult for any but the simplest cases. The step by step projective approach seems to be quite applicable when properly done, and has the large advantage of paralleling the drawing board and shop techniques, step by step.



# Selecting Machining and Drawing Fluids

**By E. L. H. Bastian**
STAFF ENGINEER, SHELL OIL COMPANY

**Part II**

DRAWING OILS, DEPENDENT upon the class and severity of drawing intended, vary widely in both physical and chemical properties. The lightest of such oils, for thin gage nonferrous stamping work, etc., may be a straight mineral neutral of S.S.U. 100 at 100 deg F.

Mineral-fatty oil blends of various viscosities and proportions are also used for light stamping and punch press work. Straight fatty oils such as lard oil are commonly used in the copper and brass industry for presswork and drawing. Fatty oils and fatty acids are typical of the so-called polar compounds which by a process of selective orientation on the metal surface are considered to be an aid in lubrication under conditions of high unit pressures. This is called physical adsorption.

The work of some investigators in this field indicates that not only the melting point of the fat or fatty oil but also the melting point of the metallic soap presumably formed with the metal at the interface has a bearing on the extent of lubrication provided.

Intermediate and heavy viscosity oils, usually compounded either with fatty acids or with other chemically active materials, are commonly used in drawing operations. Sulfurized, chlorinated, and sulfo-chlorinated compounding has been found effective for drawing of steel. Phosphates, such as tri-cresyl phosphate, are also used in conjunction with mineral oils for this purpose.

Suspensions of graphite in light volatile minerals oils or petroleum spirits are used in the hot drawing of some nonferrous metals such as magnesium, aluminum, and tungsten.

## Classification of Compounds

Drawing emulsions, soap water solutions, and soap-fat-water slurries are widely used in metal drawing, principally in the drawing of rod and wire. Soap chips, soap-fat paste type drawing compounds, and soluble oils are the usual basic materials from which such aqueous fluids are made up in the plant.

Paste type compounds containing solid pigment fillers, such as clay, talc, calcium carbonate, etc., are employed in many tube and press drawing applications, usually by predip or some preapplication to the work blank before drawing. The solid fillers prevent metal-to-metal contact in heavy draws and provide some cushioning to the die action. The compound, mixed with several parts of water, forms a heavy emulsion or slurry which facilitates application.

Various solid lubricants and coatings used in drawing include dry soap powder and lime, used in ferrous wire drawing; greases and solid fats used in bar and rod drawing, also for wire; the solid pigment fillers already mentioned and described; waxes, or wax-fat blends, and lithopone-shellac blends, etc., used in steel tube drawing.

Of the solid pigment fillers used, there are two general types. The first is the flat laminar, low shear structure type, such as exemplified by graphite, mica, and the new molybdenum-disulphide. These materials attach to the metal surface much like fish scales. Under high pressure between metal faces so coated, friction values are quite low.

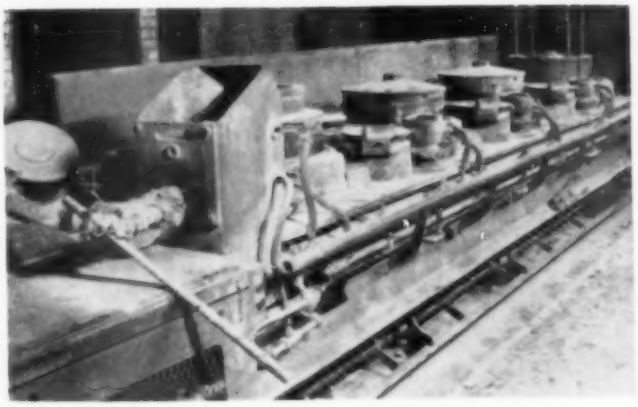
The second type of pigment filler is the "fracturable" type such as clay, carbonates, chalk, etc. Upon imposition of heavy pressures between two metal surfaces coated with such substances, they break up progressively into finer particle size and so "cushion" and protect the surfaces.

The last type of drawing lubricant to consider here is the soft metal such as lead, tin, copper, etc. Lead coating of certain grades of stainless steel tubes, rods, and wire to draw is common practice, although being gradually replaced by new methods.

Copper, tin, and zinc coating of steel wire is generally known to facilitate the drawing of such wire in ordinary soap solutions.

## Application of Drawing Fluids and Compounds

**Press Drawing**—Specific conditions regarding type of work material, whether ferrous or nonferrous, size and thickness of blanks, percent reduction to be made in the draw, and facilities for lubricant application and cleaning all have a bearing on the choice of drawing oil or compound.



Multiple-draft wire draw block showing dieholder assemblies with oil feed and return lines.

For carbon and low alloy steel drawing, a pigmented soap-fat paste type product is usually employed, although for blanking, stamping, and shallow draws, a nonpigmented soap-fat compound or even an oil may be used.

Where a compound is used, the more severe the draw, the more concentrated the emulsion required. From one to three parts of water per part of compound is common practice. Application may be by dip, swab, brush, wiper, roll, or circulation. However, circulation of heavily pigmented emulsions is not usually desirable since the pigment may settle out, clog lines, and shut down the press.

For stainless steel press drawing of all kinds, the heavy chlorinated type of drawing oils appear best for performance. Such oils, however, must be cleaned off with trichlorethylene to secure complete removal.

Aluminum is easily press-drawn either with compounded mineral oils or soap-fat compound emulsions. The latter should be high in free fatty acid for necessary good "wetting-out" of the aluminum surface and to avoid the staining effects of high alkalinity on the metal. Aluminum is "stretch-drawn" cold with bar soap, paste compound slurries, or grease, and hot "stretch-drawn" with soap, graphite, or by use of a spun glass blanket between the work and the forming dies.

Magnesium is always drawn hot (450-700 deg F) to secure the necessary ductility for drawing without fracture. For press drawing, graphite suspensions in a light volatile petroleum vehicle are commonly used. The vehicle flashes off the hot dies and work, leaving the graphite behind to lubricate and protect the dies.

Copper and brass press drawing is best done with either a fatty-mineral oil, a fatty oil, or one of the soap-fat paste type slurries. For heavy draws and cupping of some brass and bronzes, a moderately pigmented compound is used. The compound should contain 5 to 10 percent pigment and be mixed with from two to three parts of water for application.

**Bar and Tube Drawing**—Steel bars are drawn with either a heavy oil or with a precoating of dried soap-fat "dope". Steel tubes are usually precoated with "dope" or compound preparatory to drawing.

General practice, for low alloy and carbon steel tubes and bars, is to immerse the work in an emulsion of about 15 to 20 percent soap-fat concentration. This emulsion or "dope" is maintained at 120 to 140 deg F.

Prior to this immersion, the tubes or bars may have been either Bonderized in a phosphate solution or copper coated in a copper sulphate solution. The purpose of either of these treatments is to facilitate the drawing.

After immersion in the "dope" tank the tubes or bars are air-dried to set up a hard coat. Some types of high carbon tubes may then be also lime coated before drawing.

Stainless steel tubes are given special treatment preparatory to drawing. Either pretreatment of the metal surface is made in order to allow the use of conventional tube drawing "dopes", or (2) special adhesives, such as lithopone-shellac are applied to the tube, or (3) it is lead coated. New types of chemically active drawing oils at present look promising for stainless steel tube drawing. Chief among these are the heavy viscosity chlorinated oils.

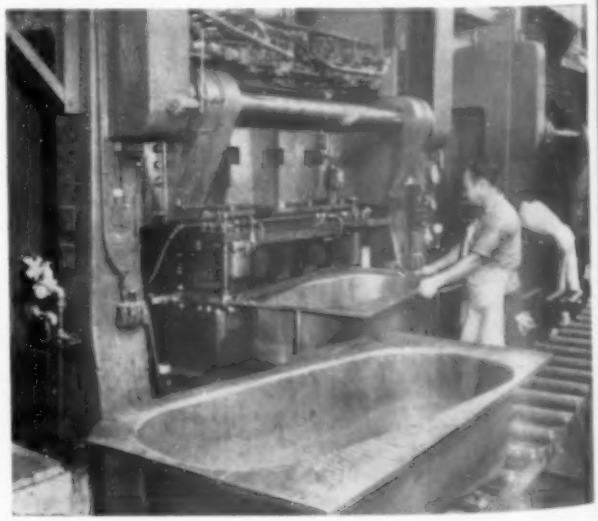
Aluminum tubes and bars are drawn with heavy compounded oils either swab-applied at the bench or circulated over the die and through the mandrel, as in the case of tube drawing. Fatty oils and soaps are the usual compounding, varying from 10 to 30 percent dependent upon the alloy of metal drawn, size, speed, and reduction to be obtained. The softer metals require more compounding to minimize metal pickup on dies and plug. Sometimes heavy residual asphaltic black oils (S.S.U. 400 at 210 deg F) are found satisfactory for aluminum tube drawing. However, these are hard to clean and may have other operating disadvantages as well.

Copper and brass tubes and bars may be drawn with either heavy viscosity (S.S.U. 150 at 210 deg F) compounded mineral oils or with soap-fat emulsions of about 15 to 25 percent solids concentration. Even leaner emulsions may be used, down to about 10 percent concentration, dependent upon the alloy and conditions of drawing.

Cupro-nickel, bronzes, and some brasses are preferably drawn with an emulsion containing some pigment filler (about one to two percent in the emulsion) to avoid chatter and give better finished tubes.

**Rod and Wire Drawing**—There are two methods of wire drawing, the "dry-draw" and the "wet-wire" method. The former employs dry soap powder, lime, or grease in a lubricant box positioned ahead of the drawing die. This die may be water cooled by suitable apertures in the die block and a piping arrangement to a circulating water system. However, the drawing lubricant itself is "dry".

The wet-wire method uses an aqueous solution, emulsion or an oil fluid circulated over the wire and dies in an enclosed machine. Whereas dry drawing may be in either a single block or a series of tandem die blocks; the wet-wire method is always used in drawing through a series of lubricant flood



One-hundred ton housing type hydraulic draw press in operation. Here proper lubrication is essential.

**TABLE I**

**DRAWING OIL AND COMPOUND RECOMMENDATIONS**

| Drawing Operation | Carbon Steel | Alloy Steel | Stainless Steel | Aluminum | Copper and Brass | Bronze Alloys |
|---|---|---|---|---|---|---|
| Fine wire drawing | E 24 | E 24 | D | B | E 40 | E 40 |
| Intermediate wire | E 24 | E 24 | D | B | E 24 | E 24 |
| Rod breakdown | G | G | D | B | E 12 | E 12 |
| Bar draw | F 4 | F 4 | D, J | B | F 6 | F 6 |
| Tube draw | F 6 | F 6 | D, J | B | E 6 | F 6 |
| Blanking and stamping | A, E 6 | B, E 6 | D | E 6 | A, E 6 | F 6 |
| Shallow press drawing | E 4 | F 4 | D | E 4 | B, E 4 | F 4 |
| Deep draw (cold) | F 2 | F 1 | D | C, E 3 H * | C, E 3 | F 3 |
| Deep draw (hot) | | | | | | |
| Heavy cupping | F 2 | F 2 | D | C, E 2 | F 2 | F 2 |

LEGEND

Types of Drawing Lubricant Recommended

A—Drawing Oil—Straight Mineral S.S.U. 100 to 300 @ 100° F.
B—Drawing Oil—Mineral—Fatty Oil Blend
C—Drawing Oil—Straight Fatty Oil
D—Drawing Oil—Sulfurized or Chlorinated Oil
E—Emulsion—Soap-fat Compound (Note 1)
F—Emulsion—Pigmented Soap-fat Compound (Note 1)
G—Solid—Dry Soap, (Sodium), or Combination with Dry Lime
H—Solid—Graphite in light vehicle (either petroleum or aqueous)
J—Solid—Soft Metal (such as lead coating)

*—Also applicable for hot draw of magnesium

Note 1—Suffix number following recommendation indicates water dilution to be used. Thus: E 4 is a mixture of 1 part compound to 4 parts of water for use.

rel dies. This is known as continuous drawing and is always used for finish drawing fine wire in both the ferrous and nonferrous wire industries.

## Ferrous and Non-ferrous Wire

Heavy ferrous wire is almost always drawn "dry" using soap powder, lime or grease.

Fine steel wire drawn by wet-wire methods use a soap-fat emulsion of about 1.5 to 2.5 percent solids concentration. This emulsion is made up in the plant from soap-fat paste type compounds.

Stainless steel wire may be drawn by either emulsions of similar type or by the use of chemically compounded drawing oils. These oils, if very viscous, may be used in block drawing like a grease, or if sufficiently fluid to circulate, may be used in continuous wet-wire machines.

Aluminum wire is best drawn by oils, usually compounded with fatty oils and soaps. Viscosities of oil used vary with the size wire drawn. Heavy rod ($\frac{3}{8}$ inch diameter) down to intermediate sizes are drawn with various heavily compounded oils of S.S.U. 1000 to 2500 at 100 deg F viscosity. Such oils can be circulated at bulk temperatures of 120-150 deg F in continuous type machines.

Intermediate wire is drawn with lighter compounded oils, and fine wire with S.S.U. 100 at 100 deg F compounded oils in high speed continuous machines.

Copper and brass wire are drawn entirely by the wet-wire method. Copper rod is drawn with emulsions of 5 to 6 percent soap-fat solids concentration at speeds up to 4,000 feet per minute. Bulk temperature of the emulsion is usually held at 140 to 160 deg F.

Intermediate size wire (B. & S. gages No. 14 down to No. 28 or No. 30) is drawn at speeds up to 5,000 feet per minute using about 3 percent soap-fat solids concentration in the circulating emulsion and bulk temperature of 120-140 deg. F.

Fine size wire (below about No. 30 B&S. gage) is drawn at speeds of 3,000 to 4,000 feet per minute in continuous machines using a very dilute circulating emulsion (about 1 percent soap solution or leaner) at a bulk temperature of 100 to 110 deg F.

## Care Essential

Both the composition and concentration of soap-fat emulsions in copper wire drawing machines must be very carefully made up and maintained to assure the right results. Too high a free fatty acid will cause excessive formation of green copper soaps which are insoluble and appear as a bright green scummy deposit inside the system and around dies. Such soaps in excess can cause clogging of dies, die wear, and other difficulties.

Too much fat in relation to soap in fine wire drawing can cause "sticky" wire, wrapping, and wire breakage.

Too much soap in the solution, or too high a concentration in the system can cause foaming. This is particularly a problem in high speed drawing of fine wire.

Bulk temperatures of systems must also be controlled to meet the particular needs of the system.

Recommended types of fluids and identification of these by description are shown in Table I.

# Metal-Stamping Operations and Die Design

By S. E. Rusinoff

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Part II

IN MANY CASES COINING and sizing offer greater economy than milling, broaching, and grinding. Coining and sizing operations, of course, can be performed only on metals which have a fairly good range of ductility, such as malleable iron castings, steel drop forgings, aluminum, and other nonferrous metal parts that offer plastic flow under action of the press.

Press selection will depend upon the magnitude and severity of the operation. For example, a drop hammer may be used when the pressure is not excessive and where the metal will flow freely into the die. Hydraulic presses are sometimes preferred for operations of this kind, principally, because of the ability of the press to utilize the greater portion of the operating cycle in actual compression of the metal, applying the remainder for rapid closing and opening of the dies.

Parts which furnish good examples of coining and sizing are connecting rods, brackets, levers, links, and numerous machine castings and forgings.

Embossing, coining, stamping and other compression operations are performed extensively for strengthening, decorating, and marking aluminum and other nonferrous metal-fabricated products. Typical compression operations are shown in Fig. 1. The tools used to perform this work are of simple construction.

## Presses for Aircraft Work

High-capacity hydraulic presses of special design are well adapted for cutting and forming an extensive range of light sheet metal parts which are used in the aircraft industry. The large presses have a maximum capacity of 5,000 tons and can form large single airplane stampings as well as groups of small parts by mounting several inexpensive dies and punches in one setting.

The Guerin process, introduced by the aircraft industry, utilizes inexpensive forming dies made from wood, Masonite, fiber, plastics, materials, and metals. Blanking or shearing dies may be made of carburized low-carbon steel strips of 3/32-in thickness (and more), slightly beveled to obtain a cutting edge. If intricate parts are to be formed, however, metal dies are recommended because of their durability.

Only lower dies are used to impart form and shape to the stampings. In place of the upper dies or punches, a heavy rubber pad is substituted which matches the lower die and does not depend upon its dimensions and shape. Forming and blanking operations, or operations combining these and other fabricating procedures, may be accomplished by a single stroke of the ram of the press. Fig. 2 shows [illegible] blanking and forming operations.

Since in the blanking operation a thick die will produce an excess of scrap, the steel die is made as thin as possible. This scrap is shown by dotted lines in the left portion of the illustration. The extra amount of stock over the cutting edge of the die usually is equal to 1½ to 2 times the die thickness; hence a minimum die thickness of 3/32 inch will require a maximum excess of metal of 3/16 inch. In action, the downward stroke of the ram brings the rubber pad in

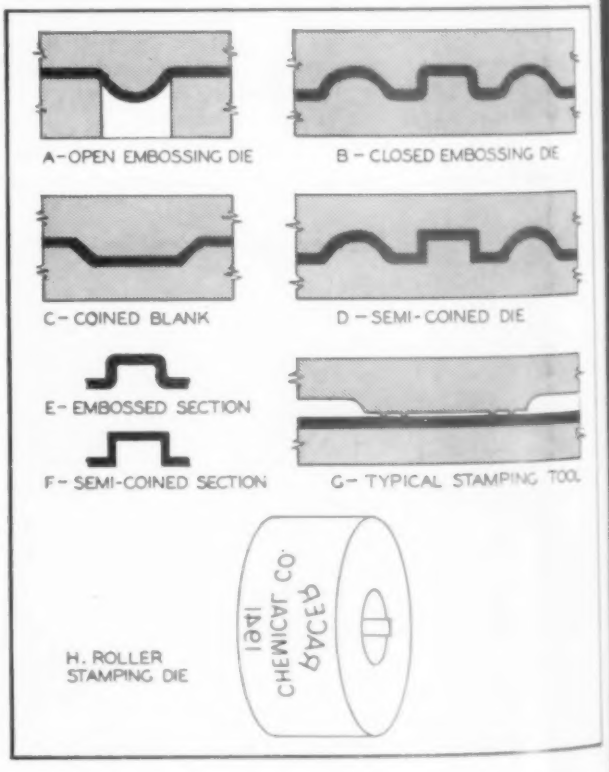



Fig. 1. Some typical embossing, coining and stamping operations

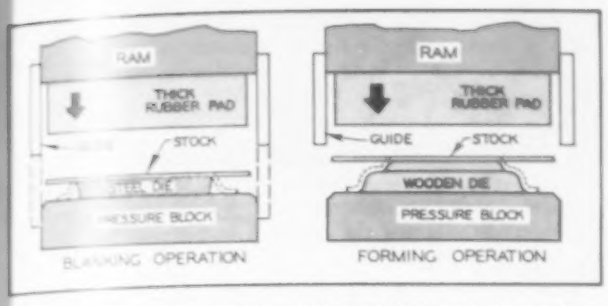



Fig. 2 illustrates principles involved in rubber-die blanking and forming operations.

contact with the stock. As the pressure continues, the metal takes the shape shown by the dotted lines. Finally, it is sheared along the cutting edges of the steel die.

Since the dies are made from inexpensive carburized steel strips, they can be changed or altered rapidly to suit frequent changes in aircraft design.

The forming operation shown at the right of Fig. 2 is carried out in the same manner as the blanking operation, except that the stock is not sheared but formed to the contour of the die. The dies are made from any inexpensive material that is capable of resisting the working pressures required to form the stamping, and is satisfactorily tough.

In aircraft work, the cutting and forming of aluminum alloy stampings is successfully carried out by the application of the Guerin process. Aluminum up to 0.050 inch thick can be cut, and the same metal of a thickness measuring 3/16 of an inch can be formed with ease. Other metals such as light-gage, low-carbon stainless steel and copper-base and magnesium alloys may be produced for various classes of work. Minimum pressures for forming aluminum are approximately 1,000 pounds per square inch, and are correspondingly higher for other metals and alloys. For shaping magnesium alloys, the forming blocks are maintained at higher temperatures in order to heat the stock as it is being formed. Fig. 3 illustrates parts fabricated by the rubber-die process on a hydraulic press.

## Stock-Feeding Mechanisms and Safety Devices

Press operation must be conducted in such a way that the operator is protected from injury at all times while steadily maintaining large-scale production of stampings. Various devices have been developed in recent years by means of which the stock is fed to the press and dies continuously. The advantages which stock-feeding devices provide in long-run production are safe operation and improved quality of the product, with uninterrupted, uniform machine feeding.

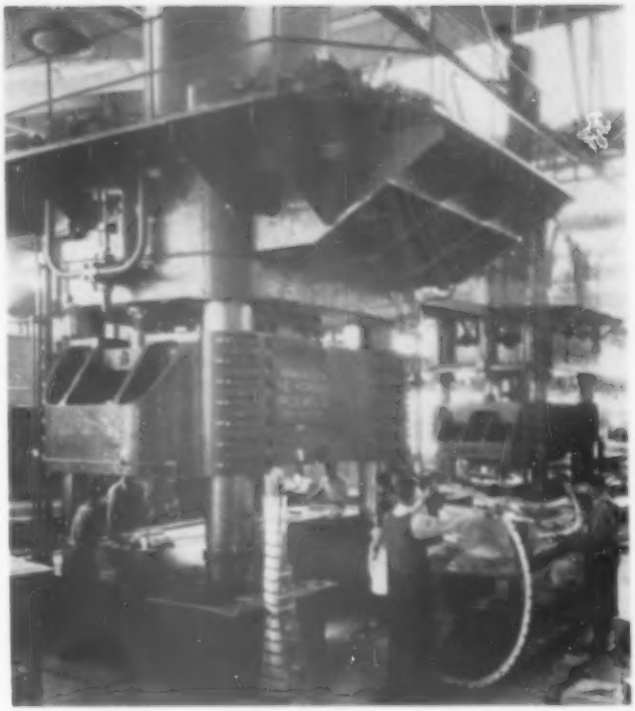


Fig. 3. Some of the types of parts which can be produced by the Guerin process.

The open-back inclinable press is considered one of the most convenient presses employed for diversified stamping operations. The dies can be mounted with ease, and the press can be inclined so that the stampings may be ejected through the back of the machine.

The double-roll feed gives double traction on the material by gripping the strip before and after it enters the die. This is one of the widely used stock-feeding devices in small-and medium-size press operations. No hand feeding is necessary at either end of the stock, therefore the operator is not exposed to danger.

The double rack and pinion roll feed is convenient for production runs in which the remaining skeleton scrap can be removed by the eccentric-operated scrap cutter which chops the scrap into pieces small enough for easy handling. A straightener insures straight stampings and prevents failure in feeding resulting from bowed stock catching in the die. An automatic centering reel, being in exact balance, permits uniform unwinding tension and therefore good feeding performance.

The speed at which roll feeds can be run depends upon the nature of the work and the distance the material has to

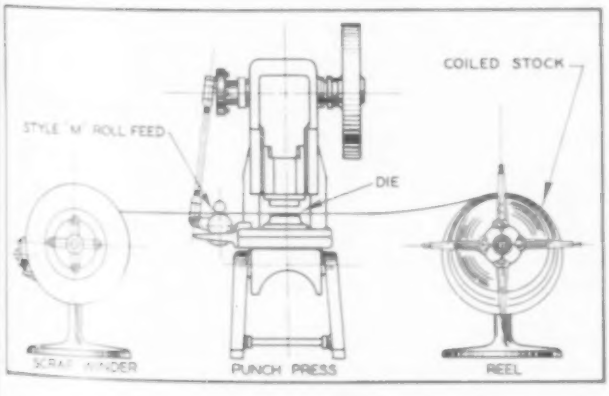



Fig. 4. Diagrammatic illustration of roll feed and scrap winder operation through punch press.

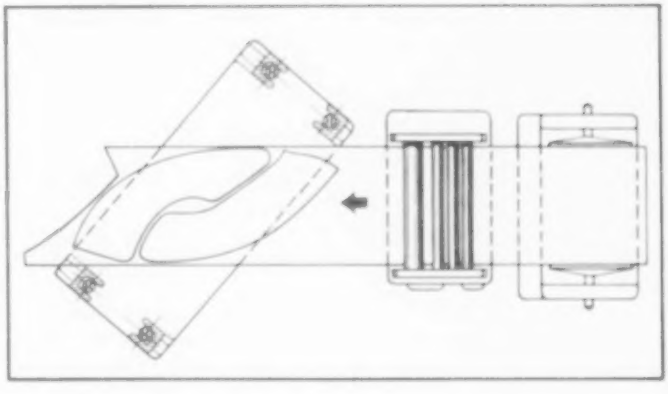


Fig. 5. Plan view of feeding and straightening machine feeding material diagonally into a blanking press.


Fig. 6 illustrates a motorized dial-press machine with forty stations.

be advanced at each stroke of the press. The usual press speeds are 100 to 175 strokes per minutes. When estimating production, the common practice is to take 75 to 80 percent of the number of possible strokes of the press.

Another arrangement of pulling the material across the die is shown in Fig. 4 where the stock is fed from right to left. The automatic centering reel is shown at the right of the figure, and a power scrap winder is shown at the left.

A new system of stamping from coiled sheet stock has been developed and is widely employed in large production runs, especially in the automobile industry. The old method of cutting blanks from sheets sheared to length is being replaced by use of directly coiled stock on blanks that can be nested, thus considerably reducing the cost of material and labor. Fig. 5 shows diagrammatically a hydraulic feeding and straightening machine which is used with a heavy-duty coil cradle in feeding the coiled steel to the press. Two fenders are blanked at a time (16 pairs per minute). There is practically no scrap or waste material remaining.

This system of feeding stock to the press is best adapted to irregular shaped blanks where a substantial saving of material may be effected by nesting the blanks. Coiled strip steel may be obtained from the steel rolling mill in widths up to 80 inches and in coils weighing from 2 to 10 tons. Large production runs in automobile plants can be carried out with great saving of steel by avoiding waste on automobile blanks. These savings amount to large sums per day when cut from the long coils of steel. Push-button controls permit flexibility in operation of the equipment.

The material is fed to the press in Fig. 5 at a 45 deg angle, thus providing the most economical distribution of stock with a negligible amount of scrap.

With the installation of air-blast valves and nozzles, faster and safer production at reduced cost may be obtained by means of ejection of stampings of various weights from the press automatically at each turn of the crankshaft. Each blast of air is perfectly timed. Automatic ejection of pieces by means of short blasts of air enables the operator to give his entire attention to the loading of the die, thus saving time and increasing production. Special chutes, safety feeders, and mechanical pickers may be provided to place the stock in the die for stamping operations, after which the completed parts are ejected by air. This cycle of operations makes it possible for the operator to keep his hands out of the danger zone.

Dial-station feeds may be suitable for second-operation work on parts previously blanked or formed in other presses. The dial indexes one station each time a stroke of the press is made, and the indexing is actuated and controlled by an eccentric on the crankshaft, which is connected to the dial by a linked mechanism.

The above-mentioned stock-feeding devices also promote safety besides increasing production and improving the quality of the work. Considerable advancement has been made in safety and accident prevention where presses are operated. Improved guards placed around moving elements of machines, safety harnesses preventing the operator from putting his hands near the die, safety switches and clutches, and push-button control are but a few of the devices employed.

## Simple Rules Used

A careful record of injuries received in punch press operations was kept by the safety department of the Western Electric Company,[1] Chicago, over a period of twenty years. Tables showing various unsafe methods in press work have been compiled in an effort to correct these dangerous practices. The more important recommendations are as follows:

1. Insist that hand tools be used when necessary.

2. Emphasize the cardinal rule—*Never place hand under punch during press operation.*

3. Stress importance of keeping guards in proper adjustment.

4. Discourage reaching around guards to remove parts.

5. Insist that the power be shut off when making adjustments.

6. Provide adequate personal protective equipment when necessary.

7. Maintain good housekeeping practices on press and around punch press area.

8. Encourage operators to report faulty punch press conditions when noted.

The author expresses to the following organizations his appreciation for their co-operation in supplying illustrations and informative material used in the preparation of this paper:

Buick Motor Div., General Motors Corporation; Aluminum Company of America; Di-Machine Corporation, Chicago; Verson All-Steel Press Company, Chicago; National Machinery Company, Tiffin, Ohio; Farrel-Birmingham Company, Inc., Ansonia, Conn.; Douglas Aircraft Company, Inc.; and F. J. Littell Machine Company, Chicago.

Other figures are taken, by permission, from "Manufacturing Processes—Materials," by S. E. Rusinoff, published by the American Technical Society of Chicago.

[1]Safety Department rules, reprinted by permission of the Western Electric Company, Hawthorne Works, Chicago.

# JIC Electrical Standards for Industrial Equipment
## (Continued)

E3.3.4 Motor compartments must be clean and dry and adequately vented direct to the exterior of the equipment and all openings must be of such height above the floor and be protected to such an extent that dirt, chips, etc., cannot enter at such times as the floor is swept or washed or the equipment is cleaned. Unless other compartments meet the requirements of the motor compartment, there shall be no openings of any kind between the motor compartment and any other compartment of the equipment. If a conduit or pipe is run into the motor compartment from another compartment not meeting the motor compartment requirements, any clearance around the conduit or pipe must be sealed.

E3.3.5 All rigidly-coupled foot mounted motors must be properly aligned and doweled in place. Motor mounting plate must be of such dimensions that if height of motor from bottom of foot to centerline of shaft is the maximum permitted by NEMA standard dimensions, motor can be inserted without fitting. Flange mounted motors need not be doweled if otherwise positively held in alignment.

**E3.4—Balance**

E3.4.1 Static and dynamic balance and noise control shall be limited to elimination of industrial equipment trouble from these sources. Specially balanced motors must be so indicated on a nameplate.

**E3.5—Motor Nameplates**

E3.5.1 Whenever the motor nameplate is not visible, a plate with duplicate information shall be provided where it can be readily seen. Nameplate shall not be removed from motor.

**E4—Wiring**

E4.0 Wiring on electronic control panels is not covered by the following standards, except as specifically stated:

**E4.1—Wiring Methods**

E4.1.2 Wiring methods here set forth shall be used for voltages not exceeding 600 volts.

*It is recommended that all motor and control circuits on industrial equipment be given a high potential test after all wiring has been completed, in accordance with American Standard for Industrial Control C19.1, and American Standard for Rotating Electrical Machinery C50.

E4.1.3 Current-carrying capacities of conductors external to control panels as shown in the National Electrical Code, shall not be exceeded.

E4.1.4 Power wiring external to the control panel shall be large enough for the next larger horsepower size motor.

E4.1.5 Taped joints in power wiring shall be covered with oil resistant adhesive tape.

E4.1.6 Underwriters' Laboratories approved solderless connectors shall be used instead of soldered type lugs.

E4.1.7 All sharp edges, burrs, rough surfaces, or threads with which the insulation of the wire may come in contact shall be removed from conduit, raceways, or any other parts.

E4.1.8 Wires shall run continuously from one piece of apparatus to another without any splice in conduit or junction boxes. Multiple control connections shall be made on terminal boards which shall be suitably enclosed.

**E4.2—Type of Conductors**

E4.2.1 All wiring shall have 600 volt insulation of Underwriters' approved varnished cambric or of thermoplastic compound, except under the following conditions:

(A) Where subject to oil, coolant, moisture, or vapor, the use of thermoplastic compound insulation is required.

(B) Where required by ambient conditions, other insulating material may be used. Special insulation shall be used for conductors flexed at temperatures below minus 10 degrees C. (14 deg F).

E4.2.2 Insulation shall not be less than 3/64 in. thick, except where it is necessary to use non metallic covered multi-conductor flexible cable.

E4.2.3 For purpose of these standards, "thermoplastic compound insulation" is defined as oil resisting, slow burning synthetic material, such as polyvinyl compound covered by ASTM Standards No. D734-43T, with a maximum operating temperature rating of 80 degrees C (176 deg F) in air, and 60 degrees C (140 deg F) in water, oil, or coolant, for a single conductor.

E4.2.4 All conductors subject to frequent movement shall have extra flexible stranding, with allowance of sufficient slack to avoid sharp flexing and strain.

E4.2.5 All wiring external to the control panel shall be stranded. Control wiring inside the control panel should be stranded.

E4.2.6 Circuit and control conductors on or in industrial equipment shall not be smaller than No. 14 A.W.G., except as follows:

(A) Copper conductors in flexible, non-metallic covered multi-conductor control cable to continuously moving parts may be No. 16 if all such conductors are insulated for the maximum voltage of any conductor in the cable.

(B) Copper conductors to electronic and precision devices, not smaller than No. 18 if in conduit, or than No. 20 if not in conduit, may be used.

**E4.3—Control Wiring**

E4.3.1 The designation "control circuits" means the circuits used for the operating control of the industrial equipment, as distinguished from the circuits used for power, such as circuits to motors.

E4.3.2 The control circuit shall be taken from a source on the load side of the main disconnect device, in which case the control circuit may be taken from the line side.

E4.3.2 (W) The provisions of Paragraph 4.3.2 do not apply in the case of welding transformers and their control circuits.

E4.3.3 Any solenoid requiring more than 2300 volt-amperes blocked in the rated maximum open position may be connected to the power circuit.

**E4.4—Identification of Wires**

E4.4.1 Wires other than control panel wires shall be identified by marking with a number to correspond with the diagram. If a conductor color coding is used, it should be used throughout the equipment and between devices on the control panel in accordance with the following table, with a legend on the wiring diagram explaining the scheme. Exception: deviation from this scheme may be made in flexible multi-conductor cable, and also on internal wiring on individual devices purchased completely wired.

The recommended color coding scheme is as follows:

A. Line and load circuits AC or DC power—Black
B. AC control circuits—Red
C. DC control circuits—Blue

**E4.4.2** When industrial equipment is so constructed that wiring must be disconnected for shipment, terminals and wires shall be marked. Markings shall be in accordance with American Standard Terminal Markings for Electrical Apparatus C6.1. When the construction of industrial equipment necessitates shipment or moving in sections, a marked terminal board in a suitable enclosure shall be provided at the sectional points.

**E.4.4.3** Wiring shall be so arranged that circuits may be checked at accessible locations, preferably at the control panel.

**E4.5—Reduced-Voltage Control Circuits**

**E4.5.1** The AC control voltage shall be 115 volts obtained from a transformer with an isolated secondary winding, and the control circuit shall be protected by a fuse or an equivalent overcurrent protective device placed in the transformer secondary circuit. (Approximately 95 volt, 50 cycle control circuits may be used to supply coils rated at 115 volts—60 cycles.) 115 volt control shall be used on all AC powered industrial equipment as follows:

(A) All operating coils of magnetic devices should be connected to one side of the control circuit with provision for purchaser's grounding of that side of the line at the control circuit transformer.

All contacts should be connected to the other side of the line except as follows:

Overload relay contacts may be connected in the line having provision for grounding, if the conductors between such contacts and the coils of magnetic devices do not extend beyond the control enclosure.

(B) The wiring diagram should show the location of the grounding connection with the notation: "To be grounded by purchaser if conditions permit".

(C) Where required for safety purposes, both sides of the line to operating coils can be broken by control contacts.

**E4.5.2** Additional control transformer capacity of 100 volt-amperes over and above current requirements, or a separate transformer, shall be provided on control panels. The primary of such transformers shall be wound for dual 230/460 voltage, with a single isolated secondary of 115 volts. Transformers for use in motor starters shall have specifications as stated above except that the additional capacity of 100 va need not be provided.

**E4.5.2 (W)** **Paragraph E.4.5.2 will not apply to welders.**

**E4.5.3** Control voltages other than 115 volts may be used where sensitive instruments, electronic tubes, or similar devices are used in the circuit.

**E4.5.3 (W)** Welding controls shall conform to Paragraph E4.5.3, with the provisions that it shall be standard to provide a nominal voltage of 115 volts between the terminals provided for circuits to the no-weld switch, pressure switch, and the welding cycle initiating switch. These circuits must be isolated from the power supply. When a low voltage transformer for the pilot circuit is specified for operator safety reasons, the secondary voltage shall be 24 volts.

**E4.5.4** NEMA size 5 or larger contactor, or any other magnetic device having an inrush (coil current measured with the magnet blocked in the rated maximum open position) exceeding 20 amperes at 115 volts, may be energized through relays having the coils fed from the control circuit, the contactor or other magnetic device being energized from the line voltage.

**E4.5.4 (P)** For safety reasons, it shall be permissible to interrupt coil circuits having an inrush in excess of 20 amperes, but not greater than 30 amperes, at 115 volts directly by control contacts, provided they are designed for such service.

**E4.6—Conduit and Raceways**

**E4.6.1** Except as modified in the following paragraphs, all industrial equipment wiring shall be totally enclosed in heavy wall conduit, conduit fittings, junction boxes, or sheet metal boxes.

**E4.6.2** General purpose flexible metal conduit may be used where necessary to employ flexible connections to pendant push-button stations, provided the weight of the pendant station is supported by other means, and provided the use of liquid-tight flexible conduit is impracticable. (See also E4.6.5)

**E4.6.3** Liquid tight flexible conduit and fittings shall be used for connections involving small or infrequent movements. Such conduits shall consist of an oil-proof liquid-tight jacket or lining in combination with a flexible metal reinforcing tubing. The fittings shall be of metal and shall not separate from the conduit under tests as prescribed by the Underwriters' Laboratories for flexible conduit. The metal reinforcing tubing shall make good electrical contact with the fittings. Such conduit shall be so installed that liquids will tend to run off the surface instead of draining toward the fittings.

**E4.6.4** Wiring connection to continously moving parts of industrial equipment shall be of approved type oil-resisting, extra flexible, non-metallic covered, multi-conductor cable; or liquid-tight flexible conduit, with extra-flexible conductors.

**E4.6.5** Compartments or raceways within the column or base of industrial equipment may be used to enclose conductors provided the compartment or raceway is isolated from coolant and oil reservoirs, is entirely enclosed, and conforms with the National Electrical Code. Conductors run in enclosed compartments and raceways within the base or column of industrial equipment shall be secured and so arranged that they will not be subject to mechanical damage or abrasion. General purpose flexible conduit may be used as additional protection in compartments and raceways if fastened at each end to a junction box.

**E4.6.6** When wires are adjacent to moving parts, the construction and the conductor supporting means shall be such that there will be a space of at least one inch between any moving parts and the conductors under all conditions of operation, or barriers shall be provided between the conductors and the moving parts.

**E4.6.7** Junction boxes shall not have extra conduit knockouts, and shall be provided with gasketed covers. All junction boxes shall be oil and water splash proof.

**E4.6.8** All conduit shall be securely held in place and supported at each end. Where threadless fittings must be used due to difficulty in assembly, conduit must be so fastened to the equipment that it cannot be accidentally pulled out of the fitting.

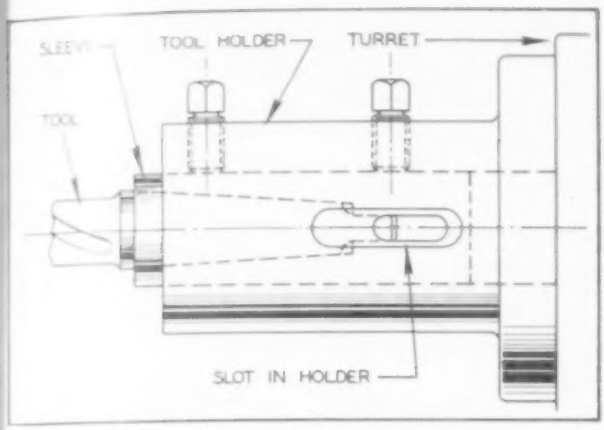
**E4.6.9** Armored cable shall not be used. Conduits from non-vapor-tight enclosures to vapor-tight enclosures shall be properly sealed by the use of approved-type fittings designed for the purpose, but in no case in motor terminal boxes.

**E4.6.10** Unless structural difficulties prevent, fittings shall be threaded and shall have strength comparable to that of the conduit.

# GADGETS

**Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work**

## Knockout for Turret Tools



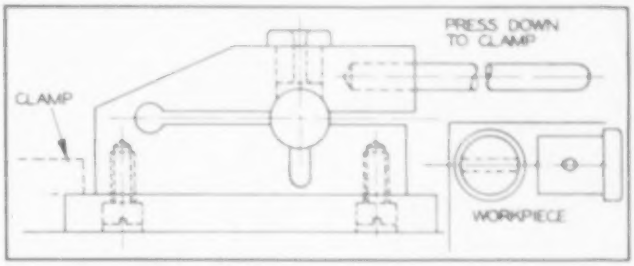

A slot in the tool holder of a turret lathe permits drills, reamers and other tools to be drilled out without removing the holder.

By adding a slot in the tool holder of a turret lathe, to align with the tang slot in taper sockets, tools may be drifted out without removing the holder from the turret. The slot in the holder should be longer than the tang slot in the socket, to allow for various lengths of taper shank tools.

*Charles Reed, Jr.*
*Allis-Chalmers Mfg. Co.*
*Milwaukee, Wisconsin*

## Jig Clamps with Pressure

A simple yet convenient jig for drilling cross holes in small parts consists of a cast iron body screwed to a base plate which, in turn, extends to permit clamping to the drill press table. After boring the hole for insertion of the part, and an "eye" hole toward the rear of the body, the latter is slotted to provide a slight spring. Usually, cast iron is springy enough; however, steel can be used if desired.

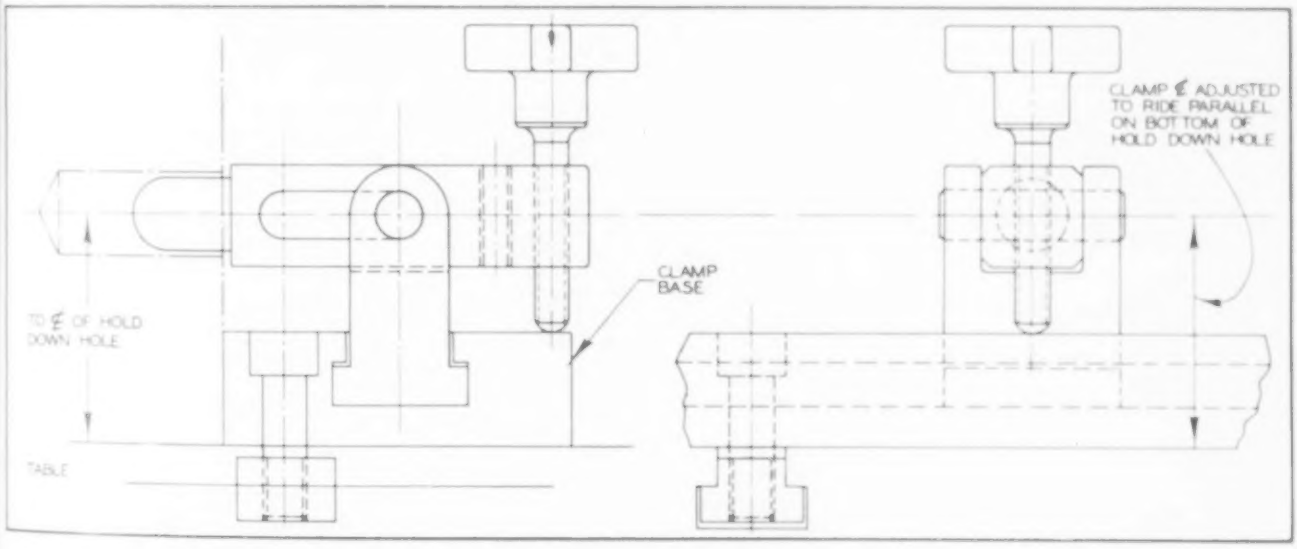



A "spring" jig, such as illustrated, serves for drilling cross holes in small workpieces.

The workpiece is inserted in the bored hole, which is made a slip fit; then, sufficient clamping pressure is effected by merely bearing down on the handle—the latter a rod of suitable length for hand comfort. A typical workpiece is shown in the inset.

*John E. Hyler*
*Peoria, Ill.*

## Quick-Acting Lateral Clamp




A unit-type clamp, such as shown, permits clamping of parts having holes which are in line vertically but unequally spaced laterally.

While the writer does not claim originality for the design, the clamp illustrated has the advantage of simplicity and fast action. The clamp is fully adjustable sideways, to permit holding down work with side holes on common centers vertically, but with variable lateral spacing.

Also, provision is made for decreasing clamping pressure. In our case, for example, we are clamping a plaster-like material which could be easily crushed. Pressure is decreased by tapping two or more holes in the clamp; the closer to center, the less the pressure. As shown, the clamp is a unit comprising a T-slotted base, a clevis and the clamp proper, with hand screw. Two drilled and counterbored holes, in the base, coincide with the T-slots of the machine table. The T-shaped clevis may be slid laterally in the base to coincide with the variably spaced side holes in the workpiece.

*G. Hooey*
*Weston, Ontario*

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*Chapter meeting night.

# Tool Industry Ready For Emergency

## Mobilization Reserve Head Tells Plans For Changeover in Event of All-Out War

H. L. Tigges

THE COMPETITIVE, free enterprise system is giving the American machine tool industry the know-how it needs to outproduce a totalitarian aggressor. What tool men have learned, while stepping up postwar mechanization of civilian manufacturing, they can turn to advantage in building tools of defense.

For some time, says Herbert L. Tigges, ASTE president, the machine tool business has been humping itself to keep up with the automotive industry's demands for more and more high production machines. "Back in August of 1949, inquiries for this type of equipment started. By November orders were coming in. Since then the volume has grown rapidly, particularly in the past two months. Every high production equipment manufacturer has a big backlog of business."

### Directs Industry Planning Group

Despite mounting pressure of work from this upswing in business, President Tigges is giving time from his post of executive vice-president, Baker Bros., Toledo, Ohio to act as chairman of the Machine Tool Industry Mobilization Organization. Under his guidance the machine tool section has been quietly preparing for an emergency such as our present dilemma threatens.

Asked how conversion from this booming civilian economy to production for an all-out "hot war" would be effected, Mr. Tigges explained, "Every machine tool manufacturer of any importance has in his files 'schedules of production' referred to by the press as 'phantom pool orders.'

"For instance, one small company has 500 machines of different types on their schedule.

"In the event of war with a major aggressor (what we have planned for, not a little war), a Washington war production official would send a wire to this manufacturer. The schedule would then become a pool order. And the company would go to work on it."

### Limited to Standard Machine Tools

But these schedules, Mr. Tigges pointed out, specify standard machine tools only—model of machine, size and quantity to be built. Whether the policy would be to use standard machine tools after starting pilot lines, or the high production type, is debatable. It would be determined according to the type and quantity required of any given ordnance item.

"Of course if American industry and its tool engineers had opportunity to look over the Armed Services' plans for new weapons and materiel, they could save a lot of time.

With accelerated programs coming out of Washington, the former director of the National Machine Tool Builders' Association went on, the Armed Services will first screen surplus machine tools in their storage depots. But the government will probably still have to buy a lot of tools. It would take considerable time just to build all the machine tools now on the phantom pool orders.

Automation, presented by several speakers at the ASTE Philadelphia convention last April, will be a big help to us, Mr. Tigges added. Electronically controlled devices will enable unskilled workers to fill gaps in the manpower supply.

### Plenty of Plant Facilities

Many of the plants used in the last war are on a stand-by basis or can be made available again to the government. The companies operating them can continue to use their regular facilities for civilian production—until they feel the pinch of material and labor shortages. Some are feeling it already through increased government orders for equipment.

Commenting on the assistance of our good neighbors in Canada, Mr. Tigges recalled the plea made by a prominent Canadian industrialist to the ASTE convention at Montreal last October. "After inspecting the modern plant operations there, our members from the U. S. were urged to drive home the fact that Canadian engineering industries 'can back up any arrangement our two governments may make in the interest of efficiency and economy.' Canadian ASTE members will make a valuable contribution in this cooperation for continental defense."

### ASTE Show Boosts Defense Effort

Although the ASTE Industrial Cost-Cutting Exposition at Philadelphia last spring was intended to give industry tools to combat a peacetime inflationary spiral, it was timed just right to help us in beating off the enemies of democracy.

"Nearly 20,000 technical men came, saw, and bought the most up-to-date equipment made in this country and abroad to speed metal working production. This widespread know-how will give the nation a great lift in the difficult days ahead," Mr. Tigges predicted.

"But regardless of our ability to get things done, another big war will hit everyone hard, much harder than the last conflict did. We'll all have to tighten our belts, dig deep in our pockets, work, pray, and fight—to preserve our way of life."

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## Board, Committees Meet To Plan Year's Activity

The ASTE board of directors will hold its 18th semi-annual meeting, October 13-14, at the Fort Shelby Hotel, Detroit. The directors will receive and act on reports of national committees, along with an extensive agenda of old and new business.

While there is no convention scheduled, members are welcome as always to

Industrial executives and ASTE national officers were speakers' table guests at the Hartford Night dinner sponsored by the chapter in that city. From left: H. E. Conrad, executive secretary; H. L. Tigges, president; R. F. V. Stanton (guest speaker), vice-president and general manager, American Machine & Foundry Co.; D. B. Huntting, chapter chairman; Joseph Burns (toastmaster), counsel, Fuller Brush Co.; Clayton R. Burt, president, Potter & Johnston Co.; Ray H. Morris, a former ASTE president, and J. P. Crosby, director-elect from Boston.

sit in on the directors' deliberations.

The Honor Awards/Judicial and Constitution and By-Laws committees will meet concurrently with the board.

Officers and directors who are in Detroit the evening of the 12th are invited to join Detroit chapter at dinner, in conjunction with an afternoon and evening Die and Stamping Symposium. (Details of technical talks in Coming Meetings column.)

An official of the National Association of Manufacturers is expected to address the group concerning the international situation. Leading Detroit industrialists also will be guests at the dinner.

In preparation for the board meeting, the elected officers will gather at Toledo, September 23-24, to draft their semi-annual report to the membership.

Other fall meetings of national committees have been lined up as follows: September 7, Editorial; September 8, Public Relations; September 9, Finance, all at the ASTE Building, Detroit.

September 29-30, Joint meeting of Program Committee and Host Chapter 1951 Annual Meeting Committee, New York City; September 23, Tool Engineering Research Fund, Detroit; September 30, Education, tentatively, Cleveland; October 6, Standards, Detroit (regular monthly meeting).

The National Membership Committee also expects to confer during the week of September 17.

## Montreal Has Field Day

Montreal, Que.—On July 7, Montreal members got together for a well attended field day at the Lachine Golf and Country Club.

Among those who addressed the gathering were: R. B. Douglas, immediate past president of the Society, and G. A. Rogers, national program chairman, both of the local chapter; and Walter Appleton, a past chairman of Toronto chapter.

Players with the best scores in the various sports and contests of skill were offered a fine selection of prizes.

A. F. Rothon and his committee had the event well organized. Everyone enjoyed the outing.

## Stanton Addresses Hartford Executives

Hartford, Conn.—Hartford chapter closed its meeting season with its annual Hartford Night. More than 350 members and guest executives attended the dinner function held this summer at Club Ferdinando.

Richard F. V. Stanton, vice-president and general manager of the American Machine & Foundry Co., Brooklyn, N.Y., and a Hartford chapter member, was the principal speaker. His subject "Shop Practice and Supervision," was presented from management's viewpoint.

Others who spoke were Herbert L. Tigges, Society president, and Harry E. Conrad, executive secretary. They discussed activities of the national organization.

Donald B. Huntting, chapter chairman, presided, with Joseph Burns, counsel for Fuller Brush Co., as toastmaster. Cyril Coleman, mayor of Hartford, brought an official greeting from the City. A stage presentation followed the speaking program.

Ellis W. Thorp, chairman of Mid-Hudson chapter; Joseph P. Crosby, a past chairman of Boston chapter and national director-elect, and Ralph I. Robbins of Boston, national professional engineering chairman, were guests at the meeting.

Prior to the dinner, the chapter executive committee met informally with Mr. Tigges, Mr. Conrad and representatives of visiting chapters.

## Research Head Retires

Worcester, Mass.—After 38 years with one employer, Albert G. Belden has retired as manager of research and engineering of the Grinding Machine Div., Norton Co.

Starting as a draftsman, Mr. Belden became chief engineer, works manager and chief engineer. At the close of the recent war, he was named manager of research and engineering.

A graduate of Worcester Polytechnic Institute, the Worcester chapter ASTE'er has been directly responsible for more than 30 patents during his career as a designer of grinding machines.

## Hunt Appoints Chairmen For New York Convention

Detroit, Mich.—Local committees for the Society's 19th annual meeting in New York, March 15-17, have been named by Harmon S. Hunt, chairman of the Host Chapter Committee, G. A. Rogers, national program chairman, has announced.

Holbrook L. Horton, a past chairman of the chapter, heads up the technical activities. Sessions will be in charge of James Fitzpatrick. Joseph P. Schneider, first vice-chairman, and Hugo L. Aglietti, chapter treasurer, share the responsibility for plant tours.

William H. Lentz, also a former chairman, will direct the social program. In this division are: Chapter Chairman Carl Kertesz, banquet, luncheons and entertainment; Chapter Secretary Virginia Martino and Florence Daniels, reception.

Supplementary functions come under Julius Schoen, another past chairman. They include: Transportation, M. M. Tanenbaum and George Bennett; sessions arrangements, Julian Wille; housing Edward Galvin; registration, Maynard Ehrenhaus; signs, Edwin M. Eckler; publicity, Idalyn Cohen, chapter publicity chairman, and Herman S. Freiman; tickets, Jay K. Wohlfeld; budgets, John Dokulil, and records and reports, Arthur Smedley.

Chairmen for individual technical sessions and for some other activities have not yet been assigned.

### Other News In This Issue

## Society's Future Depends on Staff Efforts—Tigges

Detroit, Mich.—An ASTE president works for the Society even on his vacation. At least Herbert L. Tigges does. Taking time out from his annual holiday, Mr. Tigges dropped in at headquarters, August 4, to meet each member of the staff in an informal gathering.

In the absence of Executive Secretary Harry E. Conrad, also on vacation, John B. Eacock, his assistant, introduced the office personnel, naming their respective capacities.

For the benefit of employees not closely associated with the profession, President Tigges explained how tool engineering touches their personal lives by bringing mechanical household equipment and automobiles within reach of the average family.

### Preparation Best Peace Insurance

"Tool engineers," said the executive vice-president of Baker Bros., Toledo, "are the planning group that expedites mass production. They are vital to the mobilization of industry—for peace or war. I pray that it may continue to be for peace. And I believe a prepared industry is the best insurance for peace."

The Society's success in aiding industry, he went on, hinges on the Detroit headquarters operations. "What ASTE is in years to come, when it is a larger organization, depends on what you do now. We appreciate your efforts, particularly the way you team up for big undertakings like our industrial expositions."

Since the national officers cannot devote their entire time to Society business, he told those who process services for the 18,000 ASTE members, they must rely on the central office to carry out their ideas and plans. "But we're always open to suggestion from you who are close to the job."

Besides Mr. Conrad and Mr. Eacock, the Detroit office personnel includes: Frank Wilson, technical director and handbook editor; Frances Watson, secretary to Mr. Wilson; Maxsine Bobbish, secretary to Mr. Conrad; Jeanne Barman, assistant secretary to Mr. Conrad; Lois Bramble, secretary to Mr. Eacock; Maurice Carter, accountant; Ethel Hale, accounting department stenographer; Kenneth Carroll, tabulating supervisor; Alice Headley, tabulating key punch operator.

Stanley Girard, secretary to National Standards Committee; Edythe Reichart, secretary to National Membership Committee; Lois Palmer, receptionist; Edward Kneip, mail and stationery room supervisor; Harold Kull and Sarah Williams, mail and stationery room clerks; and Genevieve Lawson, general file clerk, in addition to *The Tool Engineer* staff.

Mr. Tigges is the first ASTE president to hold such a meeting in the recollection of employees longest with the organization.

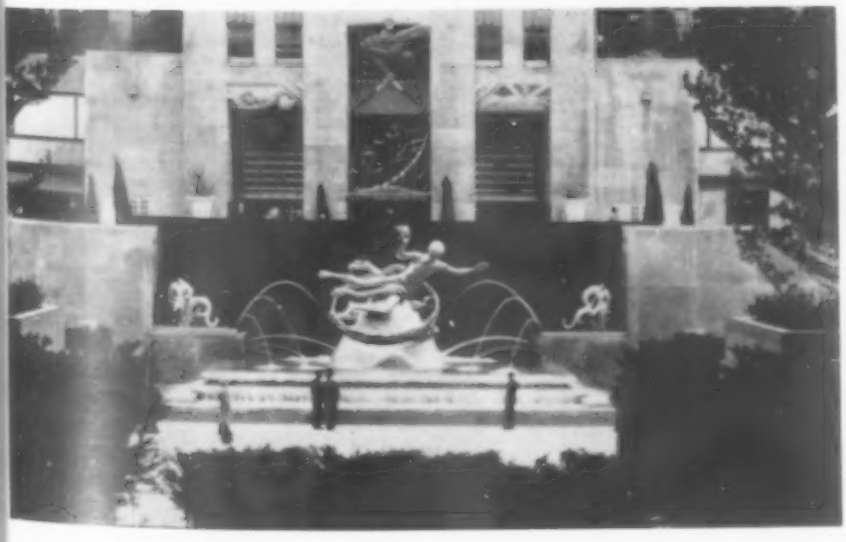
## Seely Joins Tool Firm

New York City—Gordon F. Seely of the Greater New York ASTE chapter has been appointed field engineer of the Hydraulic Tool Div., Chicago Pneumatic Tool Co., New York, the company has announced.

At present Mr. Seely is working out of the firm's Detroit plant. He was formerly with Todd Shipyard Corp.

## Cleveland Previews Next ASTE Convention Town

Like their tourists Cleveland members admired balance achieved in the poised figure dominating the Prometheus Fountain in Rockefeller Plaza. The Ohio tool engineers saw Radio City during a four-day tour of New York over the Fourth of July holiday. Visitors to the Society's 19th annual meeting in Manhattan, March 15-17, also will have opportunity to go through Rockefeller Center. Photo Courtesy New York Convention and Visitors Bureau



## New Hampshire T. E.'s Meet to Organize Chapter

Dover, N. H.—Forty-six tool men from southeastern New Hampshire industrial towns met recently at Dover Town Hall to organize the formation of an ASTE chapter. The meeting culminated a year's efforts of several ASTE'ers to stimulate Society interest in this area.

Stanley W. Lovejoy of the Boston chapter membership committee introduced V. H. Ericson of Worcester, a national director, and W. W. Young of Boston, a former director of the Society. Both men spoke on the history of the organization, membership services, and requirements for chartering a chapter.

### Woodman, Chairman Pro Tem

John H. Woodman, superintendent of tools, General Electric Co., Somersworth, was elected temporary chairman, with John H. MacInnes, chief industrial engineer, Clarostat Mfg. Co., Dover, and a Twin States chapter member, as secretary.

John Kenney of Kidder Press Co., Dover; George Chapman of Clarostat, and C. M. Mystedt of General Electric volunteered to act as a membership committee. The group expects to have its membership at charter strength sometime this fall.

Prior to the business meeting two films of New Hampshire wildlife were shown.

### Bureau Started Ball Rolling

Prominent in the groundwork for the organization of a New Hampshire chapter were: Arthur P. Bureau, president, Tri-State Industrial Co., Manchester, now affiliated with Twin States chapter; Jakob Mutzbauer, tool designer at General Electric Co., Somersworth, and a Northern New Jersey chapter member; Mr. Lovejoy, and Frank Snyder, Boston chapter membership chairman.

Potential of the proposed chapter includes about 50 plants in Dover, Manchester, Rochester, Somersworth, Portsmouth, Exeter, Concord, Nashua and surrounding towns, in addition to the University of New Hampshire and the Portsmouth Navy Yard.

A chapter in this section would serve the area between the Springfield, Vt. and Portland, Me. ASTE groups.

Industries are widely diversified. Among their products are: machines, machine tools, electrical equipment, textiles, textile and knitting machinery, building hardware, architectural iron, structural steel, instruments, machine controls, piston rings, castings, printing presses, paper mill machinery, paper goods, and roofing. There are also several engineering firms to service these plants.

G. B. Almkvist

J. B. Finlay, Jr.

Ralph Jenks

L. A. Berland

H. C. Nagabhusbana

N. L. Chen

# Around the World With ASTE Members

Last month we published excerpts of some responses W. E. Sjöstedt of Södertälje, Sweden, has received to his letters to other At-Large members.

Here are more messages to Mr. Sjöstedt from tool engineers in far places:

### India

I did receive a list of members abroad and it is my intention to correspond regularly with one or two gentlemen, because I believe that the brotherhood of engineers must be strengthened.

RALPH JENKS

*Technical Engineer (for a group of mills manufacturing mill machinery on a large scale), Lentin Court, Strand Road, Apollo Bunder, Bombay 1, India*

[Editor's Note: In a letter to the Society, Mr. Jenks says: "There is a big difference between receiving a book such as *The Tool Engineer* and an ordinary publication. *The Tool Engineer* is published in such a manner that one feels he is a member of the family when digesting the interesting information. This family touch alone is worth the cost of being a member."]

* * *

### Belgium

Our concern, created by John Cockerill in 1817, in one of the exceptional factories comprising coal and ore mines, a whole siderurgic plant and a construction organization including a shipyard in Hoboken near Antwerp.

The enterprise has more than 25,000 workers and our department is specialized in heavy construction. We are producing diesel engines up to 10,000 hp.

LEON A. BERLAND

*Chief Engineer, S.A. John Cockerill, Seraing, Belg.*

* * *

### China

The ancient Chinese proverb, "It is one of the greatest pleasures in one's life to receive a message from a friend who is thousands of miles away," just expresses how I felt at reading your letter.

I believe that your idea would be thoroughly supported by all our members-at-large, so that we will be together once in *The Tool Engineer*, although we are scattered around the world.

NAI LUNG CHEN

*729 Fiot Ave., Bethlehem, Pa.*

* * *

[Editor's Note: Mr. Chen, a former assistant professor in the aeronautical engineering department of the National University of Yunnan, Kunming, China, is now in the U. S., studying for his master's in mechanical engineering at Lehigh University.]

### Sweden

Of Gustav B. Almkvist, Mr. Sjöstedt comments: "'Bert' up to recently a member, sends greetings to Pete Horn, Earl Ruggles, Max Schiebold and other ASTE'ers back to the year 1932. Bert works for the AB Bofors, Bofors, Sweden, originators of the famous 40 mm anti-aircraft gun which was mass produced in the U. S. during the war."

[Editor's Note: Currency devaluation necessitated Mr. Almkvist's resigning his membership temporarily. Writing to the Society, he says: "Some time ago I received my copy of the 'Tool Engineers Handbook.' In my opinion it certainly comes up to all the superlatives that have been used to describe it. It is a wonderful book . . . *The Tool Engineer* has become like a dear friend coming to see me once a month. I will not be deprived of this pleasure in the future as the AB Bofors is a subscriber."]

* * *

### England

It was very good of you to write such an interesting letter in English telling me, amongst other things, that you are a member of the American Society of Tool Engineers.

It is a good thought of yours to suggest an article in *The Tool Engineer* about the foreign members. I am works director of Joseph Lucas, Ltd., manufacturers of motor vehicle equipment.

FREDERICK GARNER

*Works Director, Joseph Lucas, Ltd., King St., Birmingham 19, Eng.*

* * *

Thank you very much for writing to me. Many years ago I started as a jig and tool designer. Through various circumstances I ultimately ended with diamond tools. I worked in this field in Germany from 1931 to 1938 when I had to leave that country. Beginning in England as a consultant, I established the *Industrial Diamond Review* in 1940. Then in 1943 I started the Diamond Research Department for the De Beers group. This is now called the Industrial Diamond Information Bureau and run by Industrial Distributors, Ltd.

PAUL GRODZINSKI

*Manager, Industrial Diamond Information Bureau, Industrial Distributors, Ltd., 32-34 Holborn Viaduct, London, EC 1, Eng.*

* * *

### Australia

Your idea of the members abroad getting to know each other better is a sound one. You may be interested to learn that I spent two years in the U. S. A. recently, studying some of the large machine tool builders.

JACK B. FINLAY

*Chief Technical and Sales Engineer, Gilbert Lodge & Co., Ltd., Sydney, N.S.W., Aus.*

* * *

Mr. Nagabhusbana, whose picture also appears on this page, wrote jointly with A. Krishnaswami. Their letter was published in the August issue. Both are associated with Hindustan Aircraft, Ltd., Bangalore, India. Their organization, they report, is now mass producing aircraft and all-metal rail coaches.

## Looking for a Souvenir?

Milwaukee tool engineers designed this ash tray as a favor for their 1950 dinner dance. Guests were so pleased with the attractive souvenir that the chapter has decided to offer it to other ASTE groups.

Made of 16-gauge aluminum with an anodic finish in blue or green, the ash tray is 4 1/8 in. across. An excellent reproduction of the ASTE emblem is coined in the face of the tray, along with the chapter number.

Milwaukee chapter has the dies for this novelty and is prepared to furnish it with any chapter number. Any proceeds from the sale of the item would be earmarked for the chapter's scholarship fund.

Other chapters might augment their own scholarship treasuries by soliciting Christmas orders from their members. Officers interested in the ash tray for this purpose or as a banquet favor may obtain a sample from ASTE headquarters, Detroit. Cost of the item in various quantities is available from: A. C. Gudert, public relations chairman, Milwaukee chapter, Route 7, Box 150, Wauwatosa, Wis.

## Detroit Resumes Monthly Carbide Lecture Series

Detroit, Mich.—Following a summer recess Detroit chapter is continuing the program of carbide sessions begun last spring.

First of the fall meetings features "Introduction to Carbides." It is being presented September 7 by J. S. Gillespie, product sales manager, Carboloy Co. Mr. Gillespie's talk deals with the advantageous utilization of the physical and mechanical properties of carbides.

On October 5 a round table forum of Detroit carbide experts will discuss "Maintenance of Carbide Tools." Emphasis will be on single-point tools.

The remaining lectures are scheduled as follows: November 2, "Single-Point Carbide Tools"; January 4, "Designing for Carbide"; February 1, "High Production Machining of Steel Parts"; March 1, "Precision Boring and Reaming", and April 5, "Milling With Carbides."

The meetings are held from 7:30 to 9:30 p.m. in the Junior Room of the Engineering Society of Detroit. This program is in addition to the regular chapter meetings held the second Thursday of the month.

Bennett Burgoon, Jr., district manager of Kennametal, Inc., is chairman of the committee sponsoring the series.


Windsor Star Photo

## Record Attendance Enjoys Windsor Dinner Dance

Windsor continues to break its own ladies night attendance records. Nearly 300 tool engineers and their wives met this summer at the Rendezvous Hotel for the annual dinner dance. Group chatting at the speakers table are, from left: H. J. A. Chambers, first vice-chairman; Mrs. Chambers, W. F. Tyson, chairman, and Mrs. Tyson. More than 50 door prizes were awarded to the ladies. New chapter bell built by members appears in foreground. Stands on front of base (partially missed by camera) carry names and dates of office of chapter chairmen. Name of the organization and its charter date are inscribed on the bell itself. Base and hammer are inlaid hardwood.

## Tanner Awarded Pin For 30 Years' Service

Hartford, Conn.—For three decades of service with a single employer, H. D. Tanner, vice-president and director, Niles-Bement-Pond Co., has been honored with a gold service pin.

The award was presented by F. U. Conard, president and general manager of the company.

A Brown University graduate, Mr. Tanner joined Pratt & Whitney in 1900 as a machine designer. Fifteen years later he became manager of the Machinery Division. In 1939 he was elected vice-president and director of N-B-P.

In addition to his affiliation with Hartford chapter, ASTE, Mr. Tanner is a member of ASME, NMTBA, NAM, the Manufacturers Association of Hartford and the Army Ordnance Association.

## Fitzsimmons Breaks Ground for New Plant

Cleveland, Ohio—J. R. Fitzsimmons, founder and board chairman of The Die Supply Co., removed the first shovelful of earth recently, in the excavating for his firm's new plant to be erected at 1400 Brookpark Road.

Among those participating in the ceremony was his son, Warren H. Fitzsimmons, president of the company. The new building is scheduled for occupancy early this fall. Of modern functional design, it will provide 26,000 sq. ft. of floor space for expansion of factory and office facilities.

The senior Fitzsimmons has served Cleveland chapter as entertainment chairman. His son is the incumbent treasurer and a former secretary of the local ASTE group.

## *Coming Meetings*

CHICAGO—September 12, 6:30 p.m. Dinner at Midwest Athletic Club, 6 N. Hamlin Ave. Speaker: John A. Cupler II, president, National Jet Co., Cumberland, Md. Subject: "Microscopic Precision Drilling." Coffee Speaker: Chief Gunner's Mate Charles Cioffi, USN. Film: "Fury in the Pacific." October 10, 8:00 p.m., Western Society of Engineers, 84 E. Randolph St. Speaker: John E. Ott, executive vice-president, Acme Steel Co., Chicago. Subject: "Steel Stitching." March 17-21, 1952. Tool Engineers Industrial Exposition.

DAYTON—September 11, 6:30 p.m. Dinner, Suttmillers Restaurant. Speaker: Charles M. Brehm, sales engineer, Steel Products Engineering Co., Springfield, Ohio. Subject: "Brehm Trimming Dies." October 9, 6:00 p.m. Tour of McCall Corp. plant.

DETROIT—September 21. Tour of Oldsmobile Div., General Motors Corp., Lansing, Mich. Buses leave from ASTE Building, 5:30 p.m. Lunch served en route.

October 5, 7:30 p.m., Engineering Society of Detroit. Carbide program (see details at left).

October 12, Engineering Society of Detroit. Die and Stamping Symposium. 3:00 p.m., speaker and subject to be announced; 4:00 p.m., C. R. Cory, die engineer, Fisher Body Div., General Motors Corp., "Unusual Body Dies"; 5:00 p.m., W. E. Williams, manager, Kirksite Die and Engineering Co., "Kirksite Dies"; 8:00 p.m., E. V. Crane, chief engineer, Hydraulic Press Mfg. Co., "Metal Working Principles Involved in Press Working Operations."

October 13-14. Semi-Annual Meeting, Board of Directors, ASTE Bldg.

Student section meetings: September 21, 7:30 p.m., Engineering Society of Detroit. Speaker: C. A. Page, gage engineer, Pratt & Whitney. Subject: "Modern Gaging Practice." Speaker: J. I. Karash, process engineer, Reliance Electric Co. Subject: "Method of Reasoning for Tool Design." Film: "Dial Indicator Gages."

NEW YORK GREATER—March 15-17, 1951. Nineteenth Annual Meeting, ASTE, Hotel New Yorker.

PHILADELPHIA—Annual Executives Dinner and Educational Night, September 21, 6:30 p.m., Crystal Ballroom, Broadwood Hotel. Speaker: D. E. Davidson, vice-president, Link-Belt Co. Subject: "Materials Handling." Coffee Speaker: Dr. James Crees, president, Drexel Institute of Technology. Subject: "Coordination of Industry and Education in Training Technical Manpower."

# *Tool Engineers of Tomorrow*

## Allied Graduates Awarded Tool Engineering Degrees

Chicago, Ill.—Percy Perrson, Chicago ASTE student, is the first graduate of the Allied Institute of Technology to receive a degree of bachelor of tool engineering.

He and other members of the Chicago chapter student section were awarded this degree, July 28, at the school's commencement. Chairman of his graduating class as well as top student, Mr. Perrson received the institute's achievement award for the best senior project and thesis.

Percy Perrson, chairman of his class at the Allied Institute of Technology, Chicago, receives from President Harry Lebeson the first degree of bachelor of tool engineering awarded by the school.

His thesis, "Design of Instruments to Time a Free Falling Body," was accompanied by actual working models.

Mr. Perrson delivered an address from his class during the graduation ceremonies.

Recipients of the degree and several hundred guests heard Harry Lebeson, president of the Institute, emphasize the important role which the graduate tool engineers must play if our present economic structure is to survive. He also remarked on the vital contributions which the tool engineer has made and is expected to make in our national defense.

### Costs Outrun Productivity

Quoting Webster's Dictionary definition of tool engineering, Mr. Lebeson pointed out that the operations described apply to the manufacture of almost every item used in our daily life, from wrist watches to locomotives. Industry's big problem, he said, is to find a way to make human productivity keep pace with mounting labor and material costs.

In closing he charged the graduates to be alert to improve their abilities and to fulfill the responsibilities of their respective positions.

The Honorable Vernon L. Nickell, superintendent of public instruction for the State of Illinois, also addressed the graduating class. Mr. Nickell reviewed the school's record in the field of industrial and technical education. He discussed the real meaning of security. His interpretation embraces Faith—in God, in one's country, and in one's self. This principle, he believes, is indestructible, unchanging, and the nucleus of a full and successful career.

The invocation and the benediction were offered by Rev. R. A. Gallagher, S.J., head of the economic department of Loyola University.

Included in the audience were Thomas Barber, chairman, and Dale Long, first vice-chairman of the Chicago ASTE chapter.

## AIT Lecturer Compares Tool Control Systems

Chicago, Ill.—Gary Ellerman, chief tool engineer at Mall Tool Co., was guest speaker before a recent meeting of the ASTE student section of Allied Institute of Technology.

In the early part of his talk Mr. Ellerman dealt with tool control. He described several systems used widely by tool rooms in ordering, issuing, and caring for tools. Repair of jigs and fixtures and the classification of tools, such as positioning, cutting, forming, also were included.

While pointing out the position of the tool engineer in industry, the speaker took his audience through the various stages of manufacturing a product, from idea to finished article. A short discussion period followed his lecture.

Bernard Better, a member of the Allied Advisory Council, introduced Mr. Ellerman. H. S. Katz, vice-president and director of training at the school, presented Mr. Better.

A business meeting preceded the technical session, with Richard Lingen, student chairman, presiding.

## Central Pa. Awards Prizes to Graduates

York, Pa.—Central Pennsylvania chapter has instituted an annual award to be presented to outstanding industrial graduates of three senior high schools: William Penn in York, Eichelberger at Hanover, and McClaskey, Lancaster.

First two recipients were Robert Russell of the William Penn school and Edward A. Schmidt of McClaskey.

Chairman W. W. Faws presented a student membership in the Society and a copy of the "Tool Engineers Handbook" to Mr. Russell at the close of the school year. The Lancaster graduate received his prize from Past Chairman Charles Stephenson.

Robert Russell, industrial high school graduate, is congratulated by W. W. Faws, Central Pennsylvania chapter chairman, as he receives student membership and "Tool Engineers Handbook" awarded by chapter for outstanding work in his classes.

In offering this award the chapter hopes to introduce worthy young men to existing potentialities in the field of tool engineering.

## Dana Advances Four Toledo ASTE Men

Toledo, Ohio—Four Toledo ASTE'ers were among those recently named for promotion by the Dana Corp.

August Ehrhardt, since 1945 master mechanic of the Spicer Manufacturing Div., has been appointed to the general tool engineering staff of the corporation.

V. G. Kessler

August Ehrhardt

R. B. Haynes, vice-president in charge of manufacturing, has announced. With Spicer for 15 years, Mr. Ehrhardt will devote his efforts to seeking improvements in machine tooling operations in the corporation's divisional plants.

To fill the vacancy, Val G. Kessler has been promoted to master mechanic of the Toledo plant, according to an announcement by J. H. Jones, plant manager. Mr. Kessler has been with Spicer since 1928, starting as a toolmaker and advancing to assistant master mechanic.

Simultaneously, Mr. Jones announced the promotions of Charles Swinghammer to chief tool engineer of the transmission and torque converter division, and Donald Kiehne to chief tool estimator.

Mr. Ehrhardt is a past chairman and Mr. Kessler a former vice-chairman of the ASTE chapter. Mr. Kiehne is the incumbent treasurer.

## T.E. Families Guests At First Detroit Picnic

Detroit, Mich.—Detroit chapter's summer activities got under way with a bang at the first annual family picnic, held July 15 at Beverly Gardens north of Detroit.

From mid-morning to late afternoon there was fun for all from two to 92. Charles E. DeLong, a professional picnic director, supervised a program of games, music, baseball, horseshoes and dancing. Prizes were awarded to the best contenders. At noon everyone took time out for a basket lunch.

The engineers got their sore muscles limbered up sufficiently for a round of golf at the annual stag outing, August 5, at the Beverly Hills Golf Club.

Jack Delaney, the chapter's top golfer, Chuck Kocsis and two other pros played an exhibition match.

In the evening the stags enjoyed an open pit barbecue, and entertainment. Many were fortunate enough to take home attendance prizes.

Two Scotchmen with a single name are buddies at the Detroit chapter stag outing. The one on the left is Bill McClellan, ASTE national secretary, and sales engineer for Gairing Tool Co. The other is Bill McClelland, Detroit manager of Winter Bros. Co.

### Positions Available

TECHNICAL ASSISTANT to SALES MANAGER—For large midwest injection molding plant. Must have thorough background in mold building and design, under 40 years of age, to locate in midwest. Sales experience not necessary, but must be sales timber and willing to work for opportunity. Reply Box 218, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PLASTIC MOLD DESIGNER — For large midwest injection molder. Splendid opportunity to develop in sales for aggressive hard-working young man. Reply Box 219, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

## Piedmont Charter Member Starts 57th Year With Firm

Winston-Salem, N. C.—A man who has spent 56 years growing up with a southern plant is now growing up with a new ASTE chapter.

E. E. Edmiston

Always ready and eager to help his town and fellow man, Eugene E. Edmiston, master mechanic at the Mooresville Cotton Mills, Mooresville, became a charter member when Piedmont chapter was formed last November. In the trade and among textile paper writers, Mr. Edmiston is known as the dean of southern master mechanics.

Few men in industry have this tool engineer's record with a single employer. Fewer still have literally built their place of employment. It was back in 1894 as an 18-year-old Edmistontown farm youth that he took a job at Mooresville operating an engine. The engine pulled a brick mill that made material for constructing an addition to the old No. 1 mill building. For this work the young operator received $4.50 at the end of a 66-hour week.

### Fires and Runs Power Plant

After the addition was erected, he was promoted to operating the engine that "pulled the mill." Things were a little better now. He worked 65 hours on the night shift for $4.95 per week. But besides running the engine he had to fire two boilers with wood that he rolled himself.

At 74, oldest man in point of service at the Mooresville mills, ASTE'er Edmiston can look back on more than a half a century of industrial evolution. In 1894 the mills had one 150 hp Corliss valve engine, capable of pulling all the plant machinery. Fifty-six years later a steam plant is producing 800 kw of electric power to augment the approximately 3400 kw purchased from a utility company.

Then the textile firm did only carding and spinning, later adding a few looms. Today raw cotton goes in one end of the plant and the finished fabric emerges at the other.

Back in the early days Mr. Edmiston had one man helping him. Now the veteran master mechanic directs some 77 members of the mill staff from his office in the old mill addition which he helped construct. He also serves on the company's board of directors, is a former general chairman of the Southern Textile Association.

Active in other business, civic and fraternal organizations, he is a director of the Mooresville Federal Savings and Loan Association, the Lowrance Hospital and the Rotary Club. For several terms he was an appointee to the Town Board of Commissioners.

He is affiliated with fraternal orders, an elder in the Second Presbyterian Church. A busy man who has had time for others. But he isn't resting on his laurels after nearly six decades of good works. He is helping ASTE expand its services in the new industrial South.

## Over 200 Participate In Field Day Events

Hamilton, Ont.—With a program running the gamut from guessing games to golf, each of the 226 members, friends and associates of Hamilton chapter attending the annual field day found some activity of interest. The outing was held recently at the Dundas Valley Golf and Country Club.

Some of the engineers met their match in the ball peen carpenter's hammer provided for the nail driving contest. The golfers blamed a prevailing strong head wind, blowing perversely from green to tee, for their poor scores. Low net was captured by M. Hapis of Hamilton. Nick Wislock of Windsor stroked out a sizzling 65, not only taking the low gross, but equalling the course record.

The horseshoe pitching contest was won by Alick Allan of St. Catharines and Bert Flavelle of Hamilton.

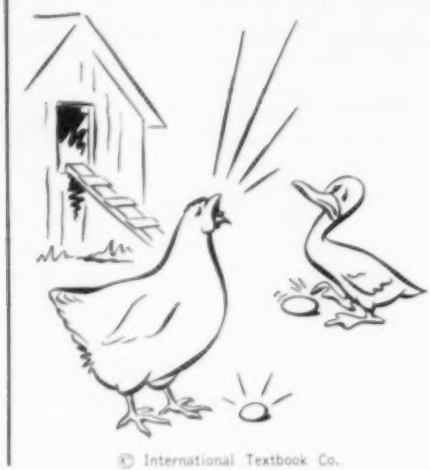
Dinner and the awarding of numerous prizes topped off the day.

During Hamilton chapter's field day, Gordon Hall (left), education chairman, R. Leevers and H. B. Ward (right), chapter treasurer, pose for the photographer on their way around the course at Dundas Valley Golf and Country Club.

## Ahern Elected Director

Hartford, Conn.—At a recent board meeting of The Bingham-Herbrand Corp. of Toledo and Fremont, Ohio, Roland J. Ahern, president and general manager of The Billings and Spencer Co., Hartford, was elected a director.

A past president of the Drop Forge Association, Mr. Ahern is a member of Hartford chapter, ASTE.



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## *'Is Your* Publicity *Showing?'*

Well, is it? Does *The Tool Engineer* carry regular accounts of your chapter doings? Do your local papers keep the home town folks informed about ASTE goings on? Can you break into radio, TV or other forms of publicity when you have special projects to promote?

If you can't answer yes to all three, then Alice Partlow Curtis' book of the same title as our head is for you. In fact it's for all non-professional publicity chairmen. In one little pocket volume of big, easy-to-read type and punchy cartoons, she gives you the lowdown on the whole publicity field.

### Learn How to Make News

Ever wonder where to start when you sit down to write your story? Yep, so do professional writers. But Mrs. Curtis tells you, out of her extensive journalistic-advertising-publicity experience, just how to go at it, what comes first, what makes news, how to make news. Samples, too, of everything from story "copy" to thank-you notes for cooperative editors.

And you who accompany your too-late news dispatches with frantic little pleas to the *ASTE News* editor to "please get it in the next issue" will learn why deadlines are inexorable.

Everybody at the meeting may know the guys who posed for the picture you sent *The Tool Engineer*. But chances are nobody at ASTE headquarters ever laid eyes on them before. Captions are only one of the things Mrs. Curtis explains about handling 8 x 10 glossies. (Wish she'd cautioned against careless packing that makes photos wind up on the editor's desk with cracks or wrinkles across the guest speaker's face.)

Maybe you're timid about introducing yourself to editors, don't know who to ask for. That's covered, also.

Been racking your brains trying to think of a way to build community interest in your fund raising plans for a scholarship? The inside information given on radio broadcasting will help you to arrange for a former award winner to be interviewed over the air about what the ASTE chapter prize means to him.

Probably more men in your area would be interested in the chapter's tool engineering course if they knew about it. Alice Curtis would suggest that you have a member take some movie sequences of class scenes for your TV station to show.

Bet you never thought of having the milkman or beer truck driver deliver store posters inviting the public to a lay program. Such as the spectacular shows sponsored by several national manufacturers, to demonstrate the wonders of modern science.

The author even reveals how you can get professional publicity people to help you for free if your "cause" is worthy.

### Set Up a Speaker's Bureau

That membership campaign would pick up recruits a lot faster if you had some qualified stumpers to plug it in the engineering departments of your local plants. Is Your Publicity Showing? has a chapter on organizing a speaker's bureau.

There are probably times when you wish you knew as much about printing as you do about industrial production. It's in the book. All about making a "dummy" (blueprint to you) and otherwise preparing your literature for the typesetter.

Publicist Curtis knows what she's talking about. She has a string of accomplishments in putting across campaigns—from Blue Cross to the United Nations.

At 1c per page (the author's manuscript runs to an even 200 folios, plus glossary and index), this is the biggest two bucks' worth of dope you can get to put your chapter on the map at home and abroad. ASTE headquarters, your bookseller or the International Textbook Co., Scranton, Pa., will hand over a copy for that small price.

But if you want to look before you leap, ask *The ASTE News* Editor for a leaflet describing book and author in more detail than we have space for here.

D.B.P.

Walter P. Schneider (left), 1949 chairman of Evansville chapter, receives his past chairman pin from Clyde Yost, also a former chairman, at the chapter picnic this summer.

## Past Chairmen Honored

Evansville, Ind.—Past chairmen had the stage or rather the field at Evansville chapter's annual stag picnic, held July 10th at the Servel picnic grounds.

Honor guests included former chairmen: Howard McMillen, general superintendent of Seeger Refrigerator Co., Clyde Yost, president of Ken Standard Corp., and Walter P. Schneider, chief tool designer of Servel, Inc. Fred Hausfeld, staff assistant at International Harvester Co., was absent on vacation.

Mr. Schneider, the chapter's chief executive last year, was presented a past chairman pin by Mr. Yost.

After dinner and a business meeting presided over by Walter Stippler, the incumbent chairman, Roy Ackerman of Servel, Inc., distributed attendance prizes.

During the late afternoon many of the 85 members and guests present worked up an appetite playing baseball, horseshoes and other sports.

## Handbook Errata Sheet Available on Request

Although the first edition of the "Tool Engineers Handbook" involved several years' work and constant revision on the part of the Society and its publisher, surprisingly few errors have been found in the first printing.

The 33 corrections made since the initial press run have been compiled into a two-page errata sheet, under the direction of the ASTE Handbook Committee. They will be furnished without charge as a service to Handbook users.

To determine whether your copy of the Handbook is from the first printing, look at page IV, following the title page. If it reads: "First Printing . . . 1949" you need the errata sheet. The corrections have already been incorporated in copies of the "Second Printing . . . 1950."

You may have the errata sheet by writing to: Editor, Tool Engineers Handbook, American Society of Tool Engineers, 10700 Puritan, Detroit 21, Mich.

## Golf Highlights Picnic

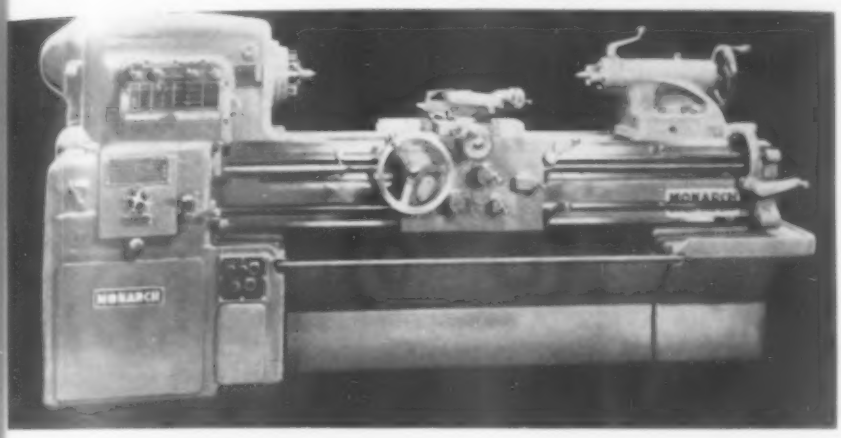
Dayton, Ohio—Ninety Dayton tool engineers took off for Walnut Grove Golf Club, July 20, for the chapter's annual picnic. After the day's activities dinner was served in the clubhouse.

Several golf awards were presented. In addition everyone received a door prize.

Lawrence R. McAfee, entertainment chairman, assisted by Richard Palmer and Fred Scheel, had charge of the event.

# TOOLS OF TODAY

## Series 60 Lathes by Monarch




A Series 60 line of engine and toolmaker's lathes, announced by the Monarch Machine Tool Company, Sidney, Ohio, incorporates important refinements in design and construction which adding to precision of operation, also minimize maintenance. The lathes are available in 14, 16, and 20 in. sizes.

Both the gear box and end gearing on these machines are totally enclosed to eliminate the possibility of accidental entry of foreign matter into these vital mechanisms. This feature, combined with the use of automatic pressure lubrication, is said to assure retention of original precision-performance characteristics, long service life, and minimum maintenance.

Headstock design is based on the use of hardened alloy-steel helical gears with ground or shaved tooth contours. Due to the extra width of the gear teeth, more tooth contact than normally possible is obtained, resulting in more efficient transmission of power. Speed changes, readily accomplished, are made by sliding heavy sided jaw clutches; consequently, shifting is not a factor of gear wear since gears are always in mesh. Accurate, rigid mounting and quick, easy interchangeability of chucks, plates and fixtures are secured through the use of an American standard type D-1 Camlock spindle nose.

Automatic pressure lubrication is provided not only to the gear box and end gearing, but also to the headstock, apron, carriage bearings on the ways and compound bottom slide on the carriage. All bearings in the Series 60 machines are of the anti-friction type.

Bed ways for carriage and tailstock are flame hardened and precision ground for long service life and retention of original accuracy. In addition to gears, other parts subject to wear are made of steel and hardened by the most suitable technique, including the induction method.

Tailstock of the toolmaker's lathes is of the quick-clamping type, and the spindle is provided with a tang slot and a graduate scale. Leadscrew reverse is operated by a lever at the side of the apron, particularly advantageous when a large amount of thread chasing must be done. Stops on the reverse rod provide close control in both directions of carriage travel, either when threading or feeding.

Depending upon their size, these Monarch engine and toolmaker's lathes may be equipped with one of several methods of cost-reducing tracer duplication. The hydraulically operated Air-Gage Tracer is supplied with the 16 and 20 in. machines. The electrically operated Motor-Trace and Monarch-Keller Controls—which are operated by magnetic clutches—are both available on the 14, 16, and 20 in. size units.

As an interesting note, all Series 60 engine and toolmaker's lathes are equally suited for work based on the metric system. Transposing end gears are available for use in connection with the standard English box, which provides pitches in millimeters and feeds in inches. These machines may be supplied on order with a metric gear box having an exceedingly wide range of both pitches and feeds in millimeters. Inversely, English transposing gears are obtainable for use in connection with the metric gear box, in which case threads are in inches and feeds are in millimeters. Module transposing gears may also be secured.

Regular engine lathe equipment comprises a dog plate, compound rest, centers, thread chasing dial, chasing stop and wrenches. Standard equipment for toolroom lathes also includes a face plate, steady rest, and oil pan. Various accessories are optional. **T-9-1**

## Cold Sawing Machine

The Ohler Hydraulic High Speed Cold Sawing Machine, by Klingelhofer Machine Tool Company of Westfield, N. J., incorporates design features which direct the cutting force against the greatest point of resistance within a rigid frame. The "absolute center" location of the saw axis, reinforced by a heavy outboard bearing, is said to provide balanced rigidity for chatter-free operation.

The frame consists of two precision ground columns mounted on a heavy base and capped by a heavy cross head. The saw head slides vertically on the columns, the entire construction being such that all operations are absorbed within the frame, with cutting force directed toward the massive base. Both weights, the saw head and cutting force are controlled by hydraulic cylinders, and clamping of the work is effected by a hydraulic vise.

Coolant is fed from above on both sides and runs into the kerf to keep the saw teeth submerged. The saw carriage has a rapid approach and return, actuated by a hand lever or automatic control, as desired, and a hydraulic feed regulator, located near the control levers, regulates feed from 0 to 20 in. per minute. Provision is made for quick interchange of saws.

The machine is furnished in two sizes—Models 660 and 1000—with capacities in rounds respectively 10¼ and 15¾ in. An interesting feature is the fast operating cycle which, in a machine of such size, is said to range from 6 to 25 seconds exclusive of actual cutting time.

**T-9-2**

## Mike With Rounded Anvil

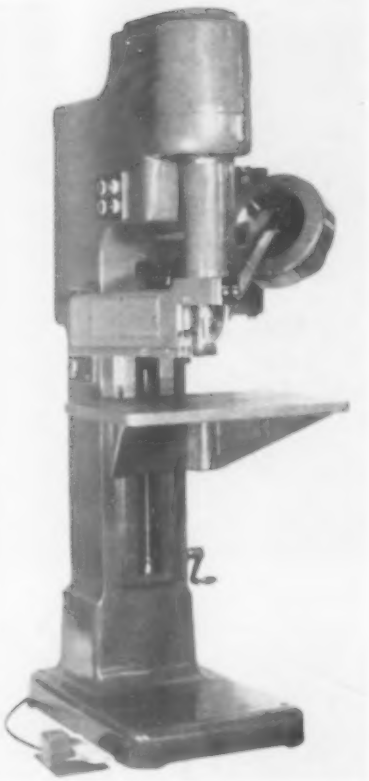
Announced by The L. S. Starrett Company, Athol, Mass., is a 0 to 1 in. micrometer with rounded anvil—the No. 577—designed to measure wall thickness of tubing, half bearings, full bearings and various cylinders with walls up to 1 in. thick and diameters down to ⅜ in. I.D.


The full-finished frame, as well as the thimble and sleeve, have rust-resistant no-glare satin crome finish and Hi-Micro finish on ends of anvil and spindle. A simple sleeve adjustment is among features of this tool which, except for the rounded anvil, conforms to the conventional standards of Starrett micrometers.

Also, by Starrett, is a Dial Depth Gage—No. 644—with flat base and eleven extra rods, in range 0-3 in. This gage is designed for measuring the depth of holes, slots and recesses. To use, the flat base is positioned on the surface of the work-piece, allowing the rod to enter the hole or recess to full depth. Measurement is registered automatically, on the dial, in increments of 0.001 in. T-9-3

## Nut Driving Machine

Expanding on its line of automatic screw driving equipment, Detroit Power Screw Driver Company, 2801 W. Fort St., Detroit 16, Mich., now announces a Nut Driving Machine which, in general, embodies the principles applied to the company's screw driving and rivet setting machines.



That is, the nuts are hopper fed to the driving mechanism which, being either semi-automatic or fully automatic, eliminates the slower and costlier method of starting the nut on the stud by hand and the tightening by means of air or electrically operated hand tools, the whole involving several handlings—the nut, the part, and the driving tool.

With this machine, the operator need only place the part to be assembled on a locating fixture and to depress a foot switch. Occasional loading of the hopper keeps the machine charged with an ample supply of nuts, all of which are fed, pre-positioned, to the driving spindle. The machine handles nuts 5/16 to 11/16 in. max. across flats, and may be used for jam, castellated or lock nuts within its range. **T-9-3A**

## Preset Speed Motor

The General Electric ACA—a-c adjustable speed—motor is now available with a preset speed device which permits manual setting of predetermined speed, either while the motor is running or at standstill. In operation, the mechanism actuates a pilot motor which drives the brushes to a position corresponding to the setting of the speed adjustment, a stop or automatic slowdown returning the brushes to lowest speed position without disturbing the original setting. **T-9-4**

## Demagnetizer By G. E.

An improved design of Demagnetizing Coil, recently announced by the special Products Division of the General Electric Company, Schenectady 5, N. Y., is said to be highly effective in demagnetizing materials and stabilizing magnetic flux.

G. E. engineers have pointed out that any unshielded magnetically soft material, including forms of iron and steel, can be demagnetized by this instrument, which can also be used to eliminate undesirable magnetic flux from tools, drills, punches, small arms, and any machined parts that may have become magnetized. It may further be used to equalize and stabilize magnetic flux in permanent-magnet assemblies such as used in electrical instruments and control devices. **T-9-5**

## Die Grinders by P & W

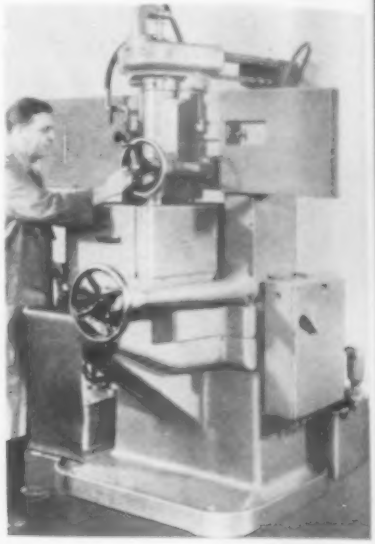
Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., announces a grinder specifically designed for facing new die blocks, reconditioning dulled impression edges and preparing worn dies for resinking. Designated the Pratt & Whitney Vertical Die and Surface Grinder, the machine is built in two sizes with table capacities 16 x 24 in. and 36 x 42 in.

Operating like a vertical profiler, the machine is said to readily finish flats around irregular reliefs and to be ideal for precision step grinding. As further claimed, surface finishes of 1½ to 2 micro inches are produced without need for subsequent lapping or polishing and with minimum breaking-down of cutting edges.

The machine consists of a rigidly constructed bed on which a hydraulically operated table reciprocates. A cross rail, supported by two uprights to the bed, carries a vertical spindle which can be moved cross ways by a sensitive control handwheel.

A constant flood of coolant is supplied through the center of the spindle to the inside of the wheel and through an auxiliary line to the outside of the wheel. Suitable guards enclose the table and confine the spray thrown by the wheel, and adjustable guards and circular brushes for each size wheel are provided for additional control of the spray.

The 16 x 24 in. machine is equipped with three spindle speed changes which adapts it for grinding carbide or tough die steels. The speeds are especially suited for 3 and 5 in. diameter grit resin wheels and diamond cup wheels. The table hydraulic drive has a variable feed range from 1 to 20 fpm.



The larger 36 x 42 in. machine accommodates the larger size blanking punch and die and forging dies. A 10 in. ring wheel is used on this machine with a spindle speed of 1750 rpm. Table hydraulic power feeds range from 1 to 40 fpm.

Sufficient clearance is provided on the machine to permit grinding between guide pins on blanking punch and die halves; thus, substantial time savings are obtained in resurfacing dulled impression edges by eliminating much of the disassembly and reassembly time.

T-9-6

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Automatic Drill Head

An Automatic Drill Head by The Dumore Company, Racine, Wis., is said to offer interesting economies in original cost, flexibility of application, high speed production, and simplification of operation in addition to savings in drill breakage and scrap losses. As claimed by the maker, the drill and scrap savings alone make this tool a self-liquidating investment for the small-drill user. The tool can be applied anywhere for drilling diameters from 0.0135 to 0.1800 in. in ferrous or non-ferrous materials.

The drill head combines a Dumore motor having a double-end armature shaft with a No. 0 precision Jacobs chuck on one end and a rotary vane compressor on the other end, the entire assembly operating as a unit. The motor supplies the power for drilling, while a self-contained air compressor advances the drill at pre-determined speed and at uniform drilling pressure.

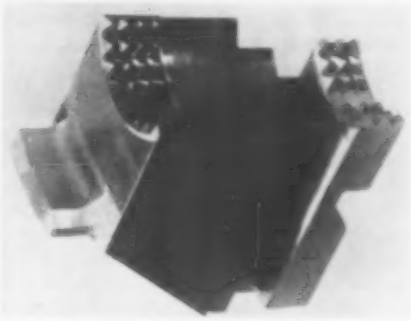
The speed of the Universal motor is controlled by the load of the rotary vane compressor, which acts as a speed governor. Thus, the drill head operates at usable work speeds varying from 2500 to 7500 rpm, depending on the pressure exerted on the drill, by adjusting the air pressure and feed regulator. Pressure and feed vary according to drill size.

Depth of stroke, which is selected by adjustable stop nuts in the head, ranges from $\frac{1}{32}$ to $1\frac{1}{8}$ in. and can be controlled to within 0.004 in. Forward movement of the drill is slowed at breakthrough by increasing pressure of the spring return, thus minimizing drill breakage and heavy burring.

For drilling holes greater than 5 drill diameters in depth, or where chip clogging is apt to occur, the unit can be operated manually. When set for manual operation, release of the actuating or foot switch allows the spring to retract the drill, thus clearing chips. The switch must then be reactuated to resume drilling operation.

Heads may be operated singly, in pairs, or in multiple groups controlled from one master actuating switch. Each head can be individually set for direction, depth, and drill size desired, and each is always self compensating to balance speed and pressure. **T-9-7**

## Colmonoy-Tipped Chuck Jaws

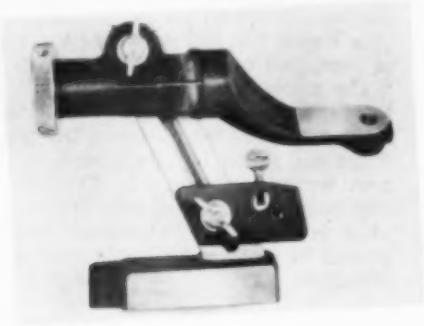


Announced by Diamonds and Tools, Inc., 19345 John R. St., Detroit 3, Mich., is the availability of Colmonoy-tipped Chuck Jaws such as illustrated. These cast inserts, which are replaceable, provide longer life and sustained accuracy as compared to hardened steel jaws.

The Colmonoy is silver soldered to the jaw; therefore, it is only necessary to heat the jaw and remove the worn insert and solder on a replacement. No heat treating is required. The inserts may be purchased separately or as complete jaws with the Colmonoy inserts ground in place and to customers' specifications. **T-9-8**

## 3-Way Wheel Dresser

A low cost, 3-way Grinding Wheel Dresser has recently been placed on the market by Detroit Industrial Products Company, 15244 Aubrey, Detroit 23, Mich. Known as the D-I-P dresser, this tool will do angle, radius, or straight wheel dressing.

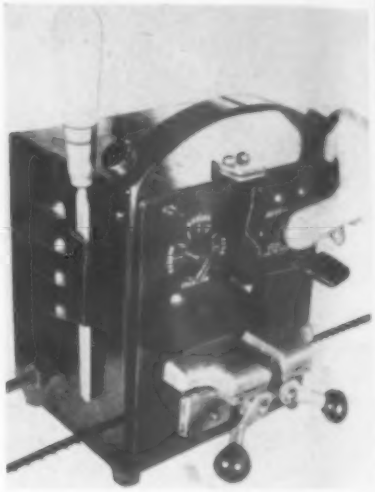


One of the advantages claimed for this dresser is that it saves time and operator fatigue by taking the diamond point to the wheel instead of raising or lowering the wheel to the dresser. A radius arm will dress either concave or convex radii, while a second diamond holder is used for straight or angle dressing. All holes for diamond points are $\frac{7}{8}$ in. I.D.

The dresser is available with either a standard or magnetic base, the latter having a release lever for breaking magnetic attraction. The standard base is used for sliding the dresser to the wheel or along a gage when angle dressing. Either base is available with or without the radius arm. T-9-9

## Portable Butt Welder

A portable, automatic saw Blade Welder for owners of bandsawing machines, announced by the DoAll Company, permits on-the-spot welding and annealing of band saw blades. Designed to produce consistently smooth, strong welds in joining saw blades to fit any size machine, it eliminates brazing and the usual delay in repairing broken bands; further, it permits internal sawing operations as the blade can be rewelded at the machine after threading through the work.



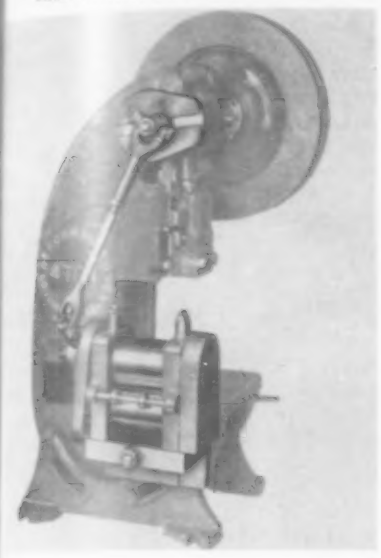
Light-weight, compact and simple to use, the welder is provided with a 6 ft. rubber covered cord to plug into any 110 or 220 volt, 50 or 60 cycle line. All controls are clearly marked and easy to operate, and quick, accurate alignment of blade ends is made possible by the cam operated jaws. A weld selector automatically provides correct spring tension to the welding jaw for welding blade widths varying from $\frac{1}{16}$ to $\frac{1}{2}$ in. while a push button switch controls the correct amount of heat for annealing operations.

This model DBW No. 10 DoAll Butt Welder is available for demonstration at Do-ALL Sales-Service stores in all principal cities. Detailed information may be had by writing the company at Des Plaines, Ill. T-9-10

## Complete Jeweler's Lathe

To save users from having to arrange their own motor drives for jewelers' bench lathes used for second-operation work, Louis Levin & Son, 782 Pico Blvd., Los Angeles 21, Calif. are now marketing a lathe unit of 3/16 or 5/16 in. collet capacity complete with bench and motor. The lathe is ready for operation on delivery. The bench has a hardwood top and fifteen drawers. The motor drive unit, designed for operation on 115 v. 50-60 cycle current, includes a reversing switch and a foot starting switch. T-9-11

## Automatic Roll Feeds



In line with demand for automatic feeding equipment, Benchmaster Manufacturing Company, 2942 W. Pico Blvd., Los Angeles 6, Calif., announces an expanded line of four models of its Automatic Friction Roll Feed. These added models will handle stock in width of 3, 5, 7, and 9 in., respectively, with an adjustable stroke which can be varied from 0 to 3 in. Maximum thickness capacity is 3/16 in. While designed for Benchmaster presses, these feeds are said to be readily adaptable to virtually all makes of presses.

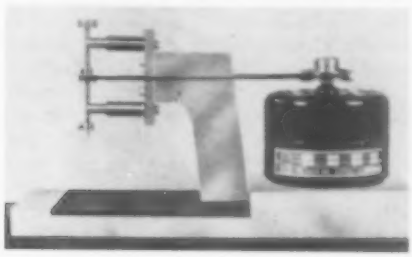
The Benchmaster feed is equipped with an angle bracket which mounts to the press bed or bolster plate, permitting vertical adjustment to align rolls with the die. Both rollers are geared to increase pulling force and to insure accuracy. **T-9-12**

## Saf-T-Cut Cut-off Wheels


Announced by Bay State Abrasive Products Company, Westboro, Mass., are the Saf-T-Cutoff wheels which, after conclusive field tests, are now released to industry. Constructed of special resinoid bonds reinforced with strong nylon fibres, these wheels are said to withstand unusual abuse while yet rendering fast, efficient cutting action on cutting off or notching non-ferrous and ferrous materials. Literature on request to the manufacturer. **T-9-13**

## Micro Drilling Machine

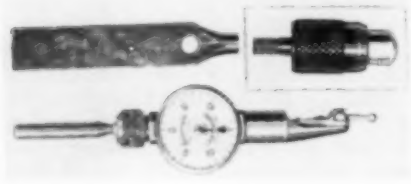
Incorporating only one moving part—the spindle—the Walcon Micro Drilling Machine is designed for precision drilling of holes in sizes down to 0.0016 in. with a minimum of drill breakage. As a unique feature of the machine, the spindle runs in oilless bronze bearings of the Vee type and is held in alignment by the endless rubber belt. Thus, whatever wear which might develop between the spindle and bearings is automatically taken up by the pull of the belt.



The belt also plays a part in the low drill breakage claimed for the machine. The angle of the drill is such that the belt exerts a "pulling up" force which prevents the drill from being pulled into the hole during break-through. Free information may be had from Dudley Cohen, 116 W. 72nd St., New York 23, N. Y., national distributor for the manufacturer, the Walcon Engineering Company. **T-9-14**

## Last Word Indicator

Announced by the L. S. Starrett Company, Athol, Mass., is the No. 711-E "Last Word" Indicator, designed to meet exacting demands of toolmakers, machinists, and setup men. Completely flexible and provided with a tighter swing, this tool can be used for precise indicating on layout, machining, or inspection operations.



A universal swivel friction holder, on the end of the body, permits its use in the chucks of jig borers, milling machines or boring mills. It is fully adjustable to sweep any hole or surface within its range. A universal shank, attachable to the end of the friction holder, allows use with 18 and 24 in. vernier height gages, and on lathe indicating.

A $\frac{15}{16}$ in. dial, graduated in thousandths, is adjustable in range 0.030 in., reading 0-15-0. A No. 16 contact unit with 0.120 in. point is regularly furnished. Additional attachments available include extension arms and couplings, a body clamp, surface gage attachments and three different size contact points.

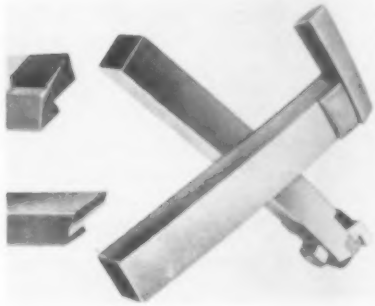
Also by Starret is a Shock Absorbing Anvil—shown in the inset—which converts any standard type indicator with a solid type contact into a shock absorbing indicator quite resistant to damage from sudden impact. The thread size on this point is No. 4-48, which is A. G. D. Standard and readily replaces the point of any make of dial indicator.

T-9-15

## Cutting Tools by Bokum

A line of Cutting Tools, introduced by Bokum Tool Company, 14775 Wildemere, Detroit 21, Mich., includes lathe and turret lathe turning tools that economically combine a blade and holder. The combination utilizes a blade in a choice of high speed steel or carbide-tipped inserted in a holder of heat-treated chrome-nickel steel. The high speed steel or carbide is employed only where it is essential—at the cutting contact.

Because the highest efficiency is attained in using the specific blade designed for its specific purpose, the line consists of six models: Style R for roughing; Style SF for semi-finishing; Style F for finishing and straight shoulder turning; Style CO for cutting off; Style TH-S—standard tool—for threading; and Style TH-A—automatic tool—also for threading. All of the models are made in 3 sizes.



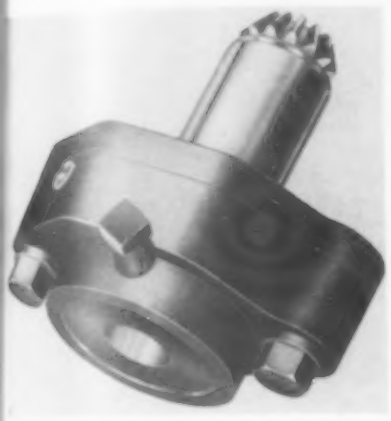
Cited features of these tools follow. The cutting blades are locked in the holders at proper cutting and clearance angles, thus obviating the necessity of reworking the angles while the cutting blade is being resharpened. Being tipped in a position similar to that employed by carbide tipped tools on screw machines, they offer maximum resistance to chip load pressure. The clamping force between the serrated blade and the clamping pad is such that the tool becomes more rigid under increasing cutting pressure.

As in the Bokum single-point boring tools, these cutting tools feature the resharpening of one face only—an important economy factor particularly in the case of carbide-tipped blades. Resharpening entails but a small trifle of replaceable carbide metal, with incidental reduced wear on diamond wheels. Full information is given in a bulletin available from the manufacturer.

T-9-16

## Deep Hole Drilling Tool

Designed for use with automatic screw machines, a Deep Hole Drilling Unit by Bryant-Schultz Corp., 2110 Walnut Street, Chicago 12, Ill., incorporates an oscillating action that breaks chips into small particles which, in turn, are dissipated along the flutes of the drill.



Drilling time is shortened because frequent pull-outs are unnecessary; also drill life is increased because of reduced heat. The tool, which is also adjustable for misalignment between turret and spindle, is available in three sizes for automatics No. 00, 0, and No. 2, and for use on multiple spindle machines.

**T-9-17**

## Diamond-Carbide Dressers

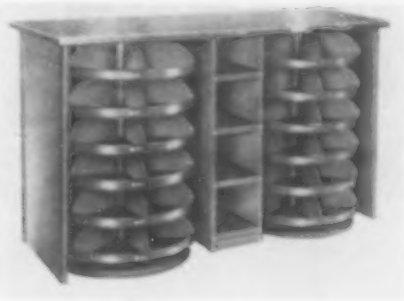
Diamond impregnated carbide Wheel Dressers, using a number of small, inexpensive diamonds embedded in a special carbide matrix instead of a single expensive diamond fitted into a steel holder, are now available from Carboloy Company, Inc., Detroit 32, Mich. Easy to use and recondition, these cluster type wheel dressers are said to stand great abuse and to eliminate the need for constantly re-mounting the diamonds.

Claimed for these dressers is great holding strength provided by the carbide matrix, which permits quite heavy infeeds. Also the dresser can be "kept sharp" by merely giving the cluster a quarter turn in the holder, thus bringing sharp diamonds into contact with the wheel. Complete recommendation for use and extended life are explained in company literature and line drawings.

**T-9-18**

## Rotabin Counter

Increased storage space under counters is provided by the F-G-M Rotabin Counter, which provides aisle access to



72 large compartments in twelve 28 in. diameter independently rotating trays. In addition, four stationary spaces are available for large items.

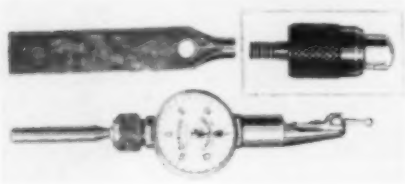
Strong, rugged and built entirely of steel, the counter is designed to stand up under hard usage. The counter top is formed from a single heavy gage sheet, with the center shelf section bolted in place. The two Rotabin units are each supported on a heavy-gage formed base.

Overall dimensions are 75¼ x 41⅝ x 27 in. deep. Finish in olive green enamel, baked on. Full information may be had from The Frick-Gallagher Mfg. Co., 250 S Broad St., Philadelphia 2, Pa.

**T-9-19**

## Last Word Indicator

Announced by the L. S. Starrett Company, Athol, Mass., is the No. 711-E "Last Word" Indicator, designed to meet exacting demands of toolmakers, machinists, and setup men. Completely flexible and provided with a tighter swing, this tool can be used for precise indicating on layout, machining, or inspection operations.



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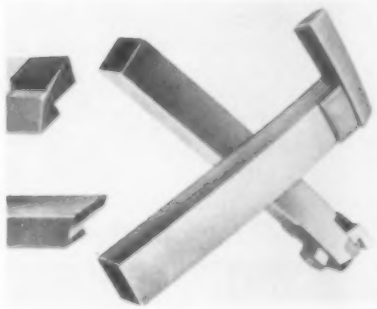

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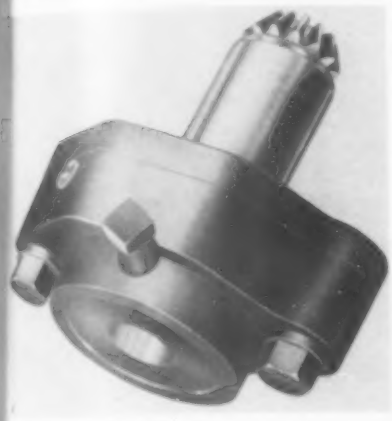

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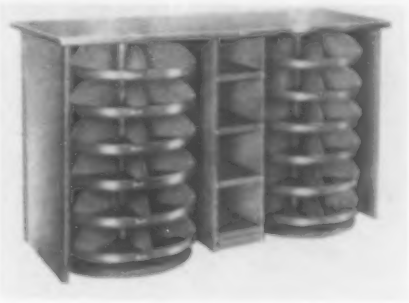

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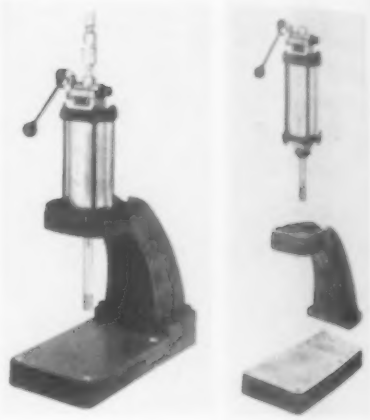
**T-9-19**

### Air Motor Arbor Stand

An Arbor Stand, by the Bellows Company, Akron, Ohio, may be used in connection with standard Bellows air motors to make a light-duty air-operated press suited to production riveting, staking, and assembling, as well as special applications.



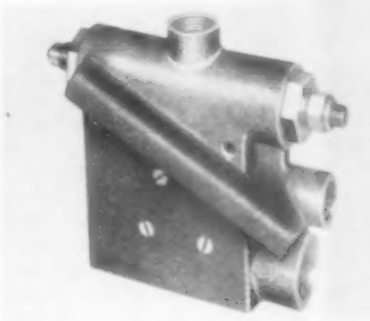
The stand is designed to take any of four Bellows air motors—Models BM-1, BM-2, BM-5, or BSSM-5—which can be readily nose-mounted. The larger size motor is said to have an impact force sufficient to punch in ½ in. diameter hole in 16 ga. mild steel.

The stand itself consists of a rigid, box-type casting, which mounts the air motor, and a base plate. The components are interchangeable; thus, fixtures can be left mounted on separate bases and used interchangeably as production requires. T-9-20

### Hydraulic-Pressure Switch

A cartridge-type hydraulic pressure Electric Switch, announced by Pantex Manufacturing Corporation, Box 660, Pawtucket, R. I., is designed for the precise control of electric circuits by means of hydraulic-pressure actuation. This switch is said to cut-in and cut-out electric circuits with as little as 12 to 18 percent pressure differential, and to be unaffected by extreme pressure surges, temporary or sustained. The unit is also said to withstand a wide temperature differential ranging from — 60 F to + 160 deg F without loss of accuracy.

Manufactured within precision tolerances, the unit is designed to eliminate failure due to either mechanical or hydraulic shock, and to operate immediately with every start of the pump without pressure build-up. T-9-21



# THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

### Hones, External

Four-page booklet X-MAN-5008 describing recently presented external hone tells how to remove "rainbow warpage" resulting from heat treating, "cloverleaf" pattern left by centerless grinding and other geometric defects; also gives advantages and recommended uses. **Sunnen Products Co.**, 7910 Manchester, St. Louis, Mo. **L-1**

### Safety Glass

Easy-to-use sliding-table Safety Eyewear Selector for use in choosing proper glasses for 69 specific jobs such as acetylene welders, drillers, platers, riveters; safety frames applicable for each task numbered and illustrated. **Bausch & Lomb Optical Co.**, 635 St. Paul, Rochester 2, N. Y. **L-2**

### Carbides

Chart suitable for wall hanging, outlines carbide grade recommendations of 9 principal carbide manufacturers to facilitate policy of specifying carbide grade equivalents; gives manufacturers' suggestions for various types of chip removal, wear and impact applications. **Wendt-Sonis Co.**, Hannibal, Mo. **L-3**

### Hose and Tube Fittings

Three-pocket portfolio of recent catalogs H-1451, E-1457 and F-1456 covering line of industrial hose, hose ends and tube fittings; give late developments, uses and advantages, working pressures accommodated. **The Weatherhead Co.**, 300 E. 131st St., Cleveland 8. **L-4**

### Tracers

Folder "Whatever Your Needs in Roughness Measurement" lists range of internal and external work covered by company's Profilometer tracers, including both straight-line and circular tracing; also describes standard piloting equipment; illustrations show typical shop applications. **Physicists Research Co.**, 321 S. Main St., Ann Arbor, Mich. **L-5**

### Milling Machine Accessories

Bulletin 2-50 illustrates and describes arbors and adapters for milling machines by leading companies; engineering and cross-section drawings, specification tables included plus up-to-date price lists. **Scully-Jones and Co.**, 1915 So. Rockwell St., Chicago 8, Ill. **L-6**

### CORRECTION

In the July issue under **Stamping**, L-3, literature on a process for precision piercing and blanking in small lots was incorrectly credited to Super Tool Co. It should have read DAYTON ROGERS MFG. CO., Minneapolis 7, Minn. Material included in Super Tool Company's catalog 50 appears below under **Carbide Tools**. **L-7**

### Carbide Tools

Sixty-four page catalog No. 50 covers entire line of carbide tipped and solid carbide tools including milling cutters, reamers, counterbores, drills, ejector type tools, brazed single point tools; contains data on available sizes, prices, recommended applications, feeds and speeds, and grinding instructions. **Super Tool Co.**, 21650 Hoover Rd., Detroit 5. **L-8**

### Gage, Air

Catalog No. 610 deals with air gage stressing advantages making for fast, economical inspection; circuit diagram explains operation; text and photos tell uses and advantages of various models; photos, drawings and specification tables describe accessories. **The Taft-Peirce Mfg. Co.**, Woonsocket, R. I. **L-9**

### Saws

Circular outlines special features of tungsten carbide tipped saws; illustrations and text point out differentiations in various types as solid (coarse and fine tooth) segmental and inserted tooth; tables present general information for selection of correct circular saw for particular applications. **Simonds Saw and Steel Co.**, Fitchburg, Mass. **L-10**

### Metal Working Fluids

Pocket-sized reference booklet "Fluids and Facts for Metal Working" covers selection of cutting fluids, oils, and paste compounds; also useful metal working facts including conversion tables, factors, SAE and AISI steel numbering systems, weights, screw and pipe thread data, other pertinent data. **Standard Oil Co. (Indiana)**, 910 S. Michigan Ave., Chicago, Ill. **L-11**

### Lathe

Double-fold Bulletin HL presents illustrations and specifications on company's 10 in. general purpose lathe; elaborates on construction and special features. **Hardinge Brothers, Inc.**, Elmira, N. Y. **L-12**

### Gages, Snap

Folder outlines advantages of recently introduced "Dializer" for attachment on adjustable limit snap gage thus converting it quickly to a dial snap gage for O.D. measurement. **Standard Gage Co.**, Poughkeepsie, N. Y. **L-13**

### Lathe, Automatic

Circular 492 describes recently introduced fully automatic lathe, outlining work it will handle, advantages and economy in use; drawings show typical jobs, and photos emphasize construction details; specifications included. **Pratt & Whitney, Div. Niles-Bement-Pond Co.**, West Hartford 1, Conn. **L-14**

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# TRADE LITERATURE Currently Offered by THE TOOL ENGINEER Advertisers

| LITERATURE NUMBER | COMPANY | BULLETIN | DESCRIPTION |
|---|---|---|---|
| A-9-124 | ADAMAS CARBIDE CORP. | | "Comparison Chart of Cemented Carbide Grades". |
| A-9-126 | AMERICAN BROACH & MACHINE CO. | CATALOG 450 | Describes broaches for internal and surface work; illustrates broaching case histories; production figures. |
| A-9-9 | BEHR-MANNING | | "Proving Ground for Production" explains availability of company's demonstration shops. |
| A-9-90 | CHARLES H. BESLEY & CO. | GRINDER BULLETIN 318-18 | Presents answers to various type grinding problems according to company's accumulated experience. |
| A-9-120 | THE CINCINNATI SHAPER CO. | CATALOG N-5 | Describes wide line of Cincinnati shapers and illustrates many uses. |
| A-9-110-1 | THE CLEVELAND TAPPING MACHINE CO. | CATALOG 283-F | "The Production Tapping Guide". |
| A-9-119 | CRUCIBLE STEEL CO. OF AMERICA | | "Crucible Tool Steel Selector" aids in choosing proper steel for specific use. |
| A-9-89 | THE CUSHMAN CHUCK CO. | CATALOG 64 | Describes Cushman series of wrench operated chucks. |
| A-9-60 | ETTCO TOOL CO., INC. | BULLETIN 35 | Contains information on Ettco-Emrick adjustable spindle multiple heads. |
| A-9-88-1 | HAMMOND MACHINERY BUILDERS, INC. | BULLETIN 701 | Gives details on motorized solid carbide insert grinding fixture. |
| A-9-72 | HANNA ENGINEERING WORKS | BULLETINS 253, 254 | Full information on Hanna Flo-Set valves, shows complete line of Hanna valves. |
| A-9-75 | HANNIFIN CORP. | BULLETIN 210 | Book on pneumatic cylinders, specifications and engineering data, diagrams and dimensions. |
| A-9-104 | KELLER TOOL CO. | | "The Hole Story", story of recently introduced drilling principle. |
| A-9-61 | THE KEMPSMITH MACHINE CO. | BULLETIN 127 | Discusses cost-cutting advantages of LH miller. |
| A-9-2 | LANDIS MACHINE CO. | BULLETIN E-97 | Tells about company's centerless thread grinding technique. |
| A-9-62 | LEPEL HIGH FREQUENCY LABS., INC. | CATALOG TE-9 | Describes uses and advantages of high frequency heating units. |
| A-9-127-2 | W. F. MEYERS CO., INC. | CATALOG 13 | Booklet describing construction and advantages of drill jig bushings. |
| A-9-101 | MILLER MOTOR CO. | BULLETINS A-103, H-104 | Illustrated brochures on Miller cylinder line. |
| A-9-69 | O'NEIL-IRWIN MFG. CO. | | "Die-Less Duplicating" catalog gives information on Di-Acro equipment; also discusses free engineering service. |
| A-9-79 | PHYSICISTS RESEARCH CO. | BULLETINS L-6, L-11 | Presents full details on Profilometer and its applications. |
| A-9-1 | PRATT & WHITNEY DIV. | | Circulars tell Diaform precision wheel-truing story. |
| A-9-125 | A. SCHRADER'S SON | | Literature on variety of company's products. |
| A-9-15 | THE L. S. STARRETT CO. | | New tools booklet describes and illustrates Starrett line. |
| A-9-94 | SWARTZ TOOL PRODUCTS CO., INC. | CATALOG 941 | Discusses types of holding fixtures for machine shop production. |
| A-9-84 | THE HENRY G. THOMPSON & SON CO. | | Booklet presents information on company's complete line of profile and band saw blades. |
| A-9-94-2 | THE VAN KEUREN CO. | CATALOG 34 | Handbook covering problems and methods, represents two years research. |
| A-9-132 | WALES-STRIPPIT CORP. | CATALOG S | Fully illustrated bulletin presents Strippit story on punching and notching equipment. |
| A-9-81 | WENDT-SONIS CO. | | Reaming Instruction Chart determines speed and horsepower for cutting steel, ferrous, non-ferrous and non-metallic materials |
| A-9-11 | THE YALE & TOWNE MFG. CO. | BULLETIN P-1254 | Describes advantages and construction features of "Load King" hoist. |

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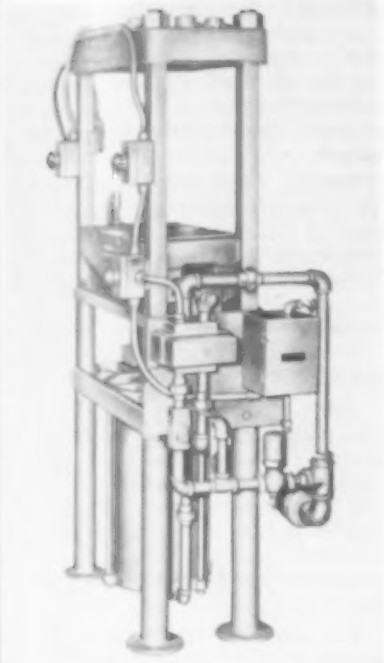
## High Speed Molding Press

Introduction of a high speed, semi-automatic, air operated, Platen-Type Press especially designed to meet the requirements of molders of Plaskan alkyd resins is announced by Hannifin Corporation, 1120 So. Kilbourn Ave., Chicago 24, Illinois.



Compact and self-contained, the press is designed to close fast, but gently, being adjustable to 2-second speed, if required, with special controlled slowing down of the platen at the instant of closing to permit accurate molding of delicate parts. This closing action is effected by a system of valving, in combination with a leverage arrangement, said to enable the press to develop 15 tons output force with 80 psi air supply.

Auxiliary equipment includes automatic timer, and the press is said to be completely adjustable for speed, cycle, and desired timing, with control by dual push buttons connected to a ¾ in. Hannifin Model NE electric valve. An instant reversing button is provided in the circuit. **T-9-23**

## Screw Driver Bits

The Donovan Company, Blackhawk Road, Beaver Falls, Pa., recently organized for the manufacture of screw driver bits, announces a complete line of Power Screw Driver Bits in the following types: ¼ in. hexagon drive, and ¼ in.—24 shank for slotted and Phillips screws; and also for the various types of Reed and Prince screws.

Bits are said to be made of exacting tolerances from a specially selected hard and tough tool steel that withstands the severe shock of torque and hardened screw applications. Bits are packaged in dozen and gross lots for convenience in handling and storage. Full information on these screw bits may be had from the Donovan Company. **T-9-24**

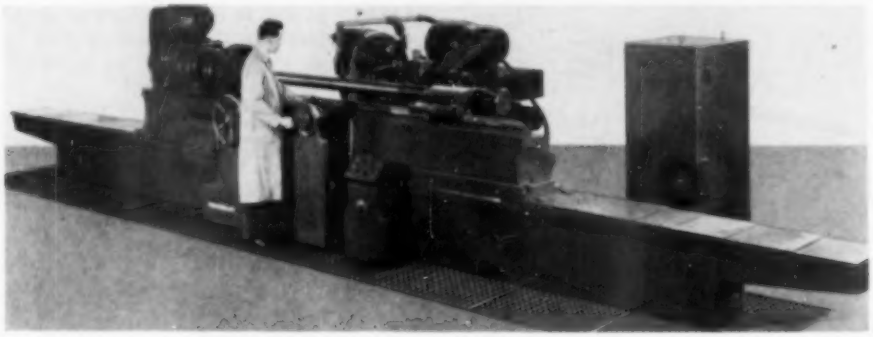
## Precision Lead Sharpener

Of interest to designers and engineering office personnel in general is a precision Pencil Sharpener, manufactured by the Rajean Mfg. Co., 906 Kingston Ave., Racine, Wis. The tool, which is motor driven, sharpens the inserted leads of the mechanical drafting lead holders to the 5 types of points ordinarily needed in the various widths of lines used on a single drawing, chisel point included.

The tool is said to produce points to consistent duplications, from $\frac{1}{32}$ in. below the chuck and down and around the extreme tip; furthermore, it is said to obviate damage to chucks such as occurs with filing or sanding. The tool is intended for individual drafting boards and for photo retouching use. **T-9-22**

## Cincinnati Filmatic Grinding Machines with 16 in. Gap

A Centertype Grinding Machine with a gap table, for grinding locomotive piston rods and similar parts requiring additional swing for a large diameter of short length, is announced by Cincinnati Grinders Incorporated. These machines have a nominal 16 in. swing, 6 in. over the gap, and are built in four lengths—96, 120, 144, and 168 in.



In general, they incorporate the design features of the Cincinnati Filmatic 14 and 16 in. Plain Grinding Machines. The grinding wheel spindle runs in Filmatic bearings, a segmental construction which develops high-pressure wedge-shaped oil films between the segments and spindle diameter, and further automatically adjust themselves to variations in forces created by the grinding action.

Spindle bearing diameters are said to be superfinished to a surface accuracy of less than one-micro-inch. Lubrication, which is automatic with circulating filtered oil, precedes spindle rotation, and initiates the starting thereof through a pressure switch. Should the lubricating system fail, the grinding wheel drive motor automatically stops.

Table traverse is by means of a rack and pinion and a simple drive from the motor, with traverse rates infinitely variable between 3 and 120 in. per minute through a d-c motor controlled electronically from an a-c source. This type of drive is said to offer a smoothness and flexibility comparable to hydraulic traverse.

The electrical system for these machines provides automatic acceleration and deceleration of the table at reversal, thereby eliminating shock. No mechanical clutches are employed, and tary at each end of the table stroke can be independently adjusted for a time delay of zero to about 18 seconds. Coolant flow and headstock spindle rotation can be stopped and started independently, or in unison with the table traverse, this also being a function of the electrical system.

The headstock is a dead spindle motor-driven unit incorporating a No. 15 B & S taper hole. The unit has an exceptionally long bearing on the table —approximately equal to the entire length of the headstock casting—and rheostate controlled spindle speeds are infinitely variable from 20 to 72 rpm. Matched V-belts and precision silent chain smoothly transmit power from the motor to the face plate.

Conforming to other sturdy construction details, the footstock bearing on the table is also much longer than conventional practice as a result of adding an apron extension at each end of the unit. A bellows type dust guard at the projecting end of the footstock spindle effectively excludes dust and grit from this important part.

Extra equipment items available include automatic wheel balancing. Controlled by a lever reached from the operator's normal working position, the grinding wheel can be quickly balanced without removing the wheel mount from the machine. Complete engineering specifications may be obtained from Cincinnati Grinders Incorporated, Marburg Ave., Cincinnati 9, Ohio. T-9-2

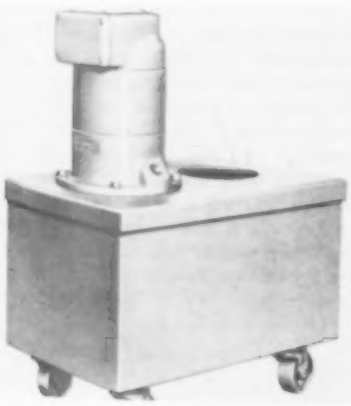
## Micro-Drill Bushings

Micro [illegible] Guide and Engineering Co., 1851 Weaver Ave., Detroit 28, Mich., has entered the micro-drilling equipment field with a complete line of over 1000 types of standardized micro-drilling bushings and liners for all types of small hole drilling operations. The bushings range from No. 80 to No. 42—or 0.0135 to $^{3}/_{32}$ in. and in four standard body diameters— $^{3}/_{32}$, $^{1}/_{8}$, $^{5}/_{32}$ and $^{3}/_{16}$ in. Liners for all body sizes are also included.

Among features claimed for these bushings, which are made of a specially developed deep hardening tungsten-type steel, are: bearing for drill extends the full length of the bushing, providing better drill support, greater accuracy in drilling, and longer life; bores accurately lapped to plus 0 to plus 0.0002 in.; bushing bores chamfered to protect drills when starting; concentricity of bore and O.D. held to within 0.0002 in.; and O.D. tolerances of both slip and press fit bushing held to a low limit of 0.0002 in. total variation. Press fits, held to 0.0003 to 0.0005 in., prevent closing in of the bore and incidental re-lapping. All fully described in company literature, available on request. **T-9-26**

## Gusher Coolant Pumps

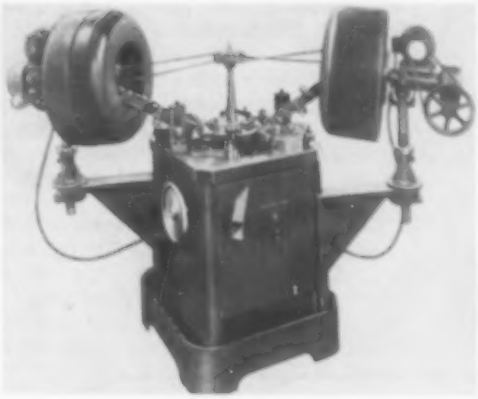
A gusher machine tool coolant pump —Model 6P3—here shown installed in a standard portable tank, has been recently added to the line of pumps by the Ruthman Machinery Co., Cincinnati 2, Ohio.



The impeller housing spacer supports, mounting flange and lower motor end bell of this pump consists of one casting. One of the spacer supports is cored to provide the discharge passage from the pump through the plate flange, an arrangement that simplifies mounting in tanks and in machine bed plates because of elimination of piping within the reservoir.

The driving motor is 1/10 HP, 3450 rpm and is equipped with precision, permanently lubricated ball bearings. The shaft is of generous size, precision ground, and is one piece, extending through the entire length of the unit. The rotating assembly is dynamically balanced by electronic process—this, by the way, now being standard practice for all Ruthman gusher pumps. **T-9-27**

## Automatic Thread Rolling Machine



Announced by the D. H. Prutton Machinery & Tool Co., 5295 West 130th St., Cleveland, Ohio, is the Rollmaster No. 120 Automatic thread rolling machine, designed to roll thread lengths up to $2^{1}/_{8}$ in. or sizes up to $^{1}/_{4}$ in. The machine is said to be capable of an output of 25,000 screws per hour, for smaller sizes, and to hold a consistent thread tolerance of class 3 or better.

Like the smaller Rollmaster No. 100, this machine is a 2-station, rotary type, thus providing independent operation of either side. Another feature of this design permits two different head types and thread lengths to be run simultaneously without mixing.

Since the feeding of 25,000 blanks per hour presented a problem, Prutton engineers developed an automatic feeding mechanism, shown in detail at right. Known as the Adjustomatic Feeding Barrel, this unit is also offered to industry as a separate item. It has a capacity of 15,000 $^{1}/_{4}$ in. screws per hour, output increasing in direct ratio to diminishing sizes. It is available in various sizes in the small parts range. **T-9-28**

## Magnetic Particle Clutch

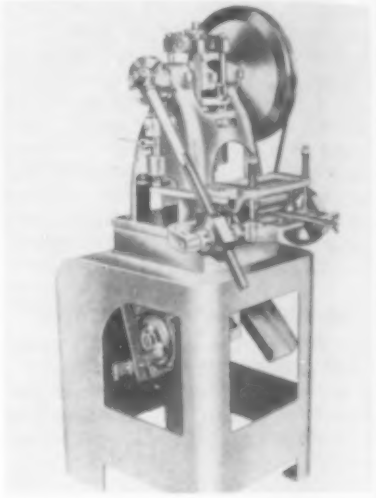
Commercially-usable magnetic-particle clutches are now available from the Vickers Electric Division, Vickers, Inc., 1815 Locust St., St. Louis, Mo., in the form of Magneclutches and Magnebrakes. First developed for use by the Navy for more efficient operation of shipboard equipment such as radar, sonar, fire control and other devices, these units are now in production for use by industry for control of torque, speed and position.

The Magneclutch is a controllable coupling which utilizes the linking action of a dry magnetic mixture, composed of iron particles and flake graphite, in a magnetic field between driving and driven parts to transmit torque. The magnetic field is established by current flowing through a coil, and by varying the current the degree of clutching can be controlled.

Design and operating advantages offered include: small control power with extremely fast response; no wear on torque transmitting surfaces; torque at zero slip; large maximum to minimum torque ratio and easy adaptation to remote control. T-9-29

## 5-Ton Diebel Hi-Speed Press

Di Machine Corp., 2711 W. Irving Park Rd., Chicago 18, Ill., announces their completely redesigned 5 ton Hi-Speed Automatic Press. The improved press embodies the following features:



A sturdier base enclosing motor, belt and pulley for more modern appearance and safer operation; feed of more rigid construction, easier to set with spring tension evenly distributed for greater accuracy and longer life; a heavier gear rack and simpler adjustment for more positive operation with less adjustment; a simpler and more dependable top roller lifting mechanism of rugged design; and a positive knockout for compound dies. T-9-30

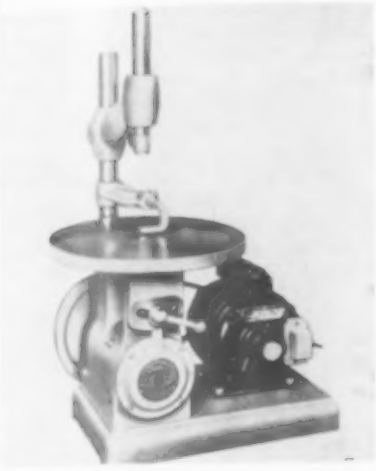
## "Precision" Oils

Two "synthetically tailored" lubricants, recommended for use in virtually all fine precision instruments, are being introduced by the Gulf Oil Corporation, Pittsburgh, Pa. The lubricants—Gulf Special Instrument Oil and Gulf Micro Bearing Oil—are the result of extended research by Elgin National Watch Company working in collaboration with the Gulf Research Fellowship at Mellon Institute of Industrial Research in Pittsburgh.

The two oils are wholly synthetic products with special properties which adapt them particularly to the lubrication of small, delicate, low torque bearings encountered in precision instruments. Both oils are said to have practically none of the ordinarily desirable creeping or spreading tendencies found in conventional petroleum oils; thus they "stay put" over long periods of time. T-9-31

## Improved Die Filer

An improved model of the Illinois Die Filing Machine has been announced. Modifications incorporated in this model, the chief utility of which is for machine filing of intricate contours, effect primarily the chucking arrangement for files, saws and stones and an improved lubrication system.



The machine operates on 110 volt, 60-cycle alternating current; however, special electrical modifications are available to suit other power supply specifications. Standard operating speed is 375 to 500 strokes per minute, although speeds as low as 250 and as high as 650 strokes are available. **T-9-32**

## Automatic Gripping Chuck

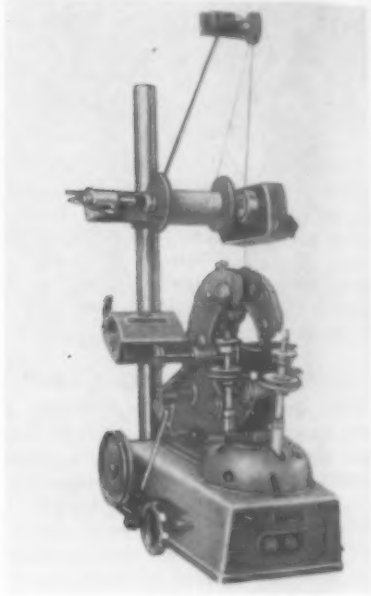
Known as the "Auto-Grip" chuck, a novel work-holding device made by the Oster Mfg. Co., Cleveland, Ohio, eliminates the use of chuck bars and T-wrenches on all 2 in. pipe threading machines which revolve the work. Gripping action of the chuck is automatic and said to be equally effective on all kinds of pipe.

The operator spins the hand wheel of the chuck until the jaws strike the pipe, then starts the machine. The chuck's jaws grip the pipe automatically —the tougher the pull, the tighter the grip. Oster threading machines now equipped with the "Auto-Grip" chuck are No. 422 Power Vise Stand, Nos. 502 and 502D "Pipe Master" portable threaders, No. 582 "Tom Thumb" portable threader, No. 782 "Rapiduction Jr." floor type threader, and No. 702 "Wilco" floor type threading machine. **T-9-33**

## Toroidal Coil Winder

As national representatives for Micafil Ltd., of Zurich, Switzerland, the Cosa Corporation of 405 Lexington Ave., New York 17, N. Y., has introduced the Toroidal Coil Winding Machine with coil supports for either high speed continuous winding around the entire core, or sector winding up to 270 deg.

Designed as a production machine and simple to operate, this winder automatically winds coil wire around toroidal or sector cores, placing each strand closely and neatly next to another, or accurately spacing them as desired. The shuttle has large wire storing capacity and is loaded at twice the normal speed while the coil remains in position. The motor is equipped with control to make stepless adjustment of angular feed during operation.



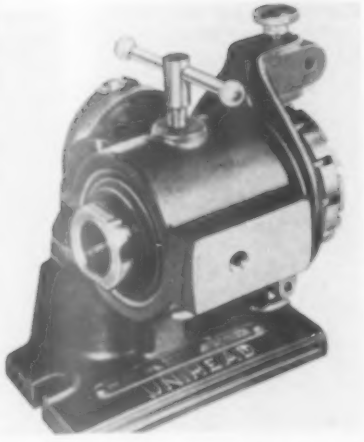
The winders are made in three sizes —RW-I, RW-II, and RW-III. Depending on the individual machine capacity, coils can be wound to the following finished sizes: maximum O.D. from 3⅛ to 8 in.; minimum O.D. 1¼ to 2¾ in.; coils with circular cross sections, minimum I.D. from 9/16 to 1⅝ in.; and maximum height from 2 to 4½ in.; coils with rectangular cross sections minimum I.D. and maximum height range from ⅝ x ¾ to 1⅜ x 2 in.

Specific winders handle single wire sizes of 23-38, 18-32, and 10-28 AWG and double or stranded wire sizes to a maximum of 2 x 26, 2 x 23, and 2 x 18 AWG. Maximum shuttle speed for winding coils is 200 rpm; for storing wire, 400 rpm. The shuttle capacities for copper wire are 1¾ oz, 6¼ oz, or 4½ lbs. T-9-3

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Unihead by Delta

The Unihead, by Delta Power Tool Division of Rockwell Mfg. Co., Milwaukee 1, Wis., may be described as a universally adjustable work head. It is designed to provide greater flexibility in grinding various types of saws and milling cutters.

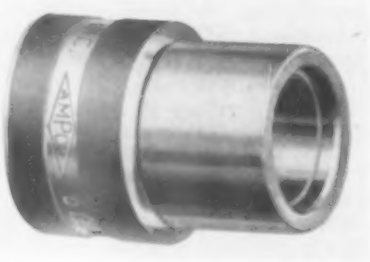



The head, which consists of a heat-treated sleeve incorporating a No. 9 Brown & Sharpe taper, turns in pre-loaded, sealed-in-life ball bearings and is designed primarily for use in the swivel table of a Delta tool and cutter grinder. However, it can be used in other makes of machines provided it is used in connection with the Delta Stop-Tooth Unit.

An adjustable index stop collar and dog can be disengaged or set in any position most convenient to the operator, a 12-tooth index collar, with selector plate, permitting the dog to automatically engage either 2, 3, 4, 6 or 12 selected equal spaces. Plain collars without selector plates are available. Further information on the Unihead may be had from the manufacturer.

T-9-35

## Die Makers Ampco Bushings




Guide Post Bushings of branded Ampco Metal, announced by Diemakers Supplies, Inc., 2779 E. Grand Blvd., Detroit 11, Mich., are made from centrifugally cast bar stock and precision machined to provide maximum supporting alignment for punches and dies.

Said to outlast steel or ordinary bronze bushings and to prevent galling and shearing of die members, the bushings are now available in the rough if so desired. No. 18 Ampco and other grades are available from stock. T-9-36

## Portable Magnaflux Unit

A portable, general-purpose Magnaflux Unit, announced by Magnaflux Corporation, is designed for wide application in maintenance, safety, and general inspection. The low price of the unit includes a day of instruction in magnetic particle inspection at no further cost to the purchaser. Training of a maintenance man or inspector will be under direction of an experienced Magnaflux field engineer.

The KH-05 Magnaflux Unit, as it is called, is developed to furnish the best on-the-job inspection and, being readily portable, may be wheeled to equipment which may need to be inspected in place. An accessory compartment in the unit, contains powder and materials needed, and built-in storage space carries the 30 ft. of magnetizing cable and line cord to reach the nearest 110 volt outlet.

Complete information on this inspection unit may be had from Magnaflux Corporation, 5900 Northwest Highway, Chicago 31, Ill. T-9-27

## Vibration Absorber

Finn & Co., 2850 Eighth Ave., New York 30, N. Y., announces a noise and vibration absorber—the Soundzorber—for installation in pipe lines. Its purpose is to eliminate damaging effects of pipe line noises and vibrations which are sources of major difficulties in installations handling liquids, compressed air or gases.

The Soundzorber is a specially constructed rubber pipe used as a flexible connection between the pump and the pipe line, and may be used for water systems and pumps, boiler and air conditioning systems, and wherever liquids are being pumped and pipe line flexibility is required. Available for pipes from ½ in. to 14 in. diameter, it is said to have a 5:1 safety factor. T-9-28

## Overload Safety for Presses

A novel overload safety device for mechanical presses— the Loadtrol—is announced by Clearing Machine Corporation, 6499 W. 65th St., Chicago 38, Ill. When so specified, Clearing presses now in manufacture will include the device, which is applied to one end—usually the bottom—of each tie rod.

The unit consists of an air cylinder connected by a lever arm through an eccentric pin arrangement in such a way that the tie rod moves a short distance when a predetermined pressure is exceeded. This movement also disengages the clutch by means of an electrical control.

In addition to protection against overload damage, the device is said to permit preloading the tie rods cold in a matter of minutes. Since the yielding pressure can be adjusted as required, tryouts and settings of dies are greatly simplified, especially so in the case of small dies which may call for less than full press capacity. The Loadtrol can then be set accordingly to prevent damage to dies.

A modification of the same device is offered for protecting the links on the outer slide of a double action press. For this purpose Loadtrol units are mounted on the outer slide connections. A bulletin, giving full particulars about the loadtrol will be sent free on request addressed to the main office. **T-9-39**

## Light Concentrator

Announced by the Clarkstan Corp., 11921 W. Pico Blvd., Los Angeles 64, Calif., is the Light Concentrator, a device designed for use wherever fine work may cause eye strain. The device, which can be attached to any frosted 40-50 watt light bulb, would be particularly useful for diemakers, instrument makers, laboratory technicians, and for assembly of small parts.

The spot of illuminations is said to be 4 in. diameter 12 in. from the bulb, with the brightness of the working area improved about five times. It can be quickly slipped onto and off the bulb. **T-9-40**

## Plain and Universal Millers by K & T

Announced by Kearney & Trecker Corporation, Miwaukee 14, Wis., is a line of general purpose knee-type Milling Machines in plain and universal styles. Designated as Model CK, the group is offered in five sizes, Nos. 2 through 6. In the order stated, spindle horsepower ratings are 10 and 15 for Nos. 2 and 3, and 25 HP for Nos. 4 through 6.

Principal features include a redesigned column, said to be heavier by over 1000 pounds depending on machine size; a spindle-mounted flywheel, running with 3-bearing support; and a 2 in. diameter, heavy-duty table feed screw, running in an extra long bronze nut and completely eliminating backlash.

In addition to increased horsepower ratings, coupled with independent motor drives for spindle and for feed and rapid traverse, spindle and feed motors are interlocked with positive automatic safety control for overload conditions, preventing cutters from stalling in the cut.

Another feature is an innovation in the form of a double duty spindle nose on Nos. 4, 5 and 6 size machines. In addition to the conventional No. 50 Nat'l Standard spindle nose, a No. 60 heavy-duty driving flange has been integrally forged with it to permit improved cutting efficiency when large diameter face mills, or flange type arbors for large diameter side and slot milling cutters are used.

Feeds and speeds are designed to take full advantage of modern cutting tools—feed changes from 3/8 to 90 in. per minute are provided on all machines, and 24 spindle speed changes are provided. The speed range on Nos. 2 and 3 machines is 15 to 1500 rpm, and 13 to 1200 on Nos. 4 through 6. Gear clashing in changing speeds is eliminated by an automatic protecto-mesh controlling system.

Mono-lever control facility for table feed and rapid traverse for faster, simpler and less fatiguing operation are optional on Nos. 2 and 3 sizes, standard on Nos. 4 through 6. Further incorporated are non-glare, rapid-set micrometer dials with satin finish and high contrast figures and increment marking for improved legibility, and fast, positive locking at all settings.

The universal style machines are equipped with a novel hypoid-type universal spiral dividing head, provided with a quick indexing ratio of 5:1 between spindle and handcrank. Another modern feature is the non-sticking taper No. 50 Nat'l Standard spindle. This conforms to the machine spindle, with which standard milling machine tools can be used interchangeably. Chucks and face plates are mounted direct without special adapters. Preloaded ball bearings in the dividing head spindle to overcome oil film float and assure a constant lifetime factor of accuracy.

In general appearance and internal construction these Model CK milling machines carry over such original K & T features as the three-bearing spindle, double overarms; an enlarged compartment for easier access to the cross-mounted motor; and heavily ribbed box-section sponson design of column and knee. Lubrication is principally automatic through a forced flood system to the column and knee and a positive metered, pressure pump system for the table saddle and knee ways and the table feed assembly. T-9-II

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## Universal Scroll Chuck

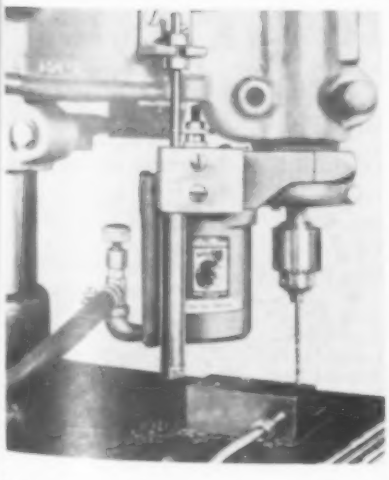
The Universal Manufacturing Co., New Britain, Conn., has announced a Union type Universal Scroll Chuck with scroll bearing surface in the back portion of the chuck, an innovation claimed to represent the only major design change since the introduction of the original scroll chuck. This, and other refinements in the chuck, are said to result in increased accuracy, reduced weight, less setup time, an improved safety factor, added strength through finer pitch scroll, and wider and thicker jaws.

In this design, as contrasted to conventional scroll chucks, all machining and finishing center on one identical point—the spindle. With the scroll located in the back of the chuck, the bearing ring represents a continuation of the spindle; thus, the scroll hub is integral with the chuck back and is machined on exactly the same type spindle that the chuck will be used in; therefore, it is inherently concentric with the spindle. The chuck will be available in sizes 6, 8, 10 and 12 in. to fit various A.S. spindle noses. Complete information may be had by writing the manufacturer. **T-9-42**

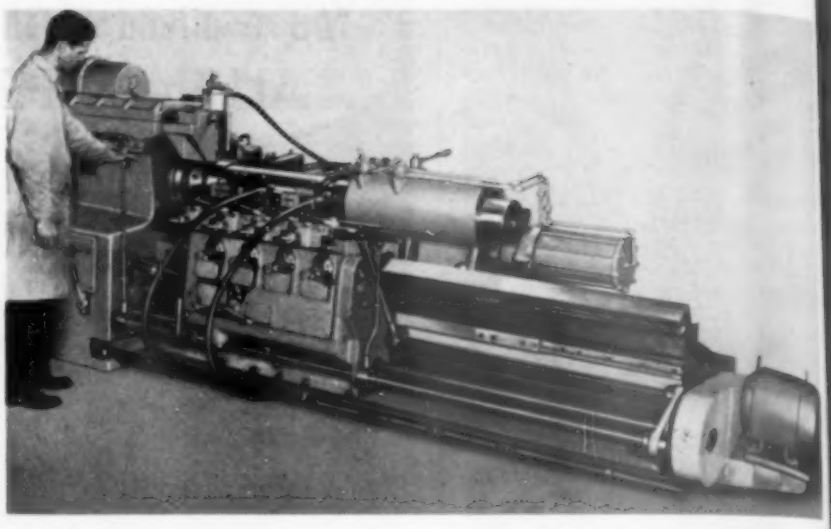
## Hydro-Check for Drills

Mead Specialties Company, 4114 No. Knox, Chicago 41, Ill., has introduced the Mead Hydro-Check, a device designed to provide improved resistance for pneumatic drill press feeds and other air cylinder operated feeds.

The device, which is readily attached to the drill press feed through two holes in the mounting block, will provide a steady resistance to power of the air feed, or increased resistance at a definite point of the stroke, particularly at the break-through of the drill. **T-9-43**



## Large Capacity Lathe



The Seneca Falls Machine Co., Seneca Falls, N. Y. announces the Model "LS" semi-automatic Lo-swing Lathe. A development of a specialized lathe used extensively during the war for turning large gun tubes and high explosive shells, this lathe retains many of the structural features of the original model but incorporates greater versatility and ease of change-over.

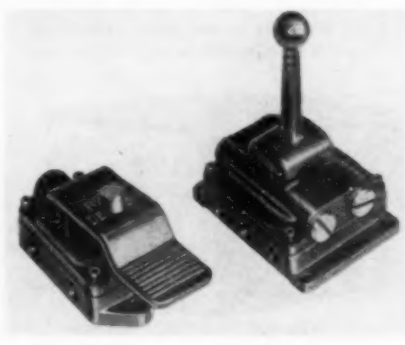
The principal change is in the design of the front turning carriage, which now maye be equipped with two or more individually controlled power-operated cross slides which feed the tools into the cut. Tool cutting pressures are taken on large rolls, fitted to the bottom of each slide, which remains in constant contact with the cross feed cam.

Other late features include a cam feed back-squaring attachment operating on an automatic cycle with push button control; an adjustable stop for positioning the carriage in relation to the starting point of the cut, and automatic tool relief at the end of the cut. Basically, the Model "LS" Lo-swing can be described as a ruggedly constructed lathe designed to take full advantage of modern sintered carbide tools, having tremendous cutting capacity at high cutting speeds and coarse feeds. Fully described in Seneca Falls Bulletin No. LS-50. T-9-4

## 880 Series Valves by Ross

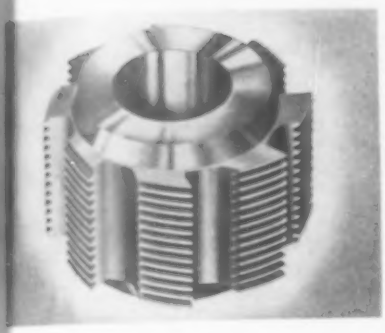
An Air Valve for quick, positive control of small cylinder operation, announced by the Ross Operating Valve Company, 120 East Golden Gate Ave., Detroit 3, Mich., is designed for a multitude of uses such as on jigs and fixtures. Chief feature is flexibility due to interchangeability of parts, the valve being available with a vertical handle; with a vertical handle with spring return; horizontal handle; horizontal handle with spring return; double treadle foot lever; or single treadle foot lever with spring return.

A separate base, designed for bottom or side ports, permits manifold mounting. A level seat is standard, but non-level is optional. A two or three-position locking arrangement, or a non-locking, or a combination can be supplied. The valve is available in 3-way or 4-way models, with ¼ and ⅜ in. pipe sizes. T-9-4



## Fine Pitch Hobs

Illinois Tool Works, 2501 No. Keeler Ave., Chicago 39, Ill., announces a complete assortment of Fine Pitch Hobs as an extension of its line of cutting tools. Fine pitch hobs are intended to cut 20 DP gears and finer, the Illinois line is primarily designed for high-production tooling for manufacturing small gears such as used in clocks, instruments, timers and small mechanisms.



The extreme precision requirements of these small hobs limits pitch hob lead variation in one turn to 0.0003 in. maximum — fine enough! — yet, in the gears produced, a profile error of only 0.0002 in. can represent as much as 3 percent of total tooth thickness.

The extreme precision requirements of fine pitch hobs gives rise to acute inspection problems, especially so when special equipment for lead checking may not be immediately available. To meet this condition, Illinois Tool Works furnishes a Toolgraph Chart with each pitch hob shipped. Since this chart is an easily read individual graph of the actual variation in the lead of each hob, the need for difficult fine pitch hob lead inspection is said to be eliminated. **T-9-46**

## Dovetail Cutters

Reltool Dovetail Cutters, manufactured by Reltool Corporation, 7th & Michigan Aves., Milwaukee 3, Wis., are shank-type tools designed for use in standard types of end mill holders. Right-hand cut is standard, with either 45 or 60 deg angle, as specified. Made of high speed steel and used in place of arbor type and threaded-hole cutters, they are available from stock in the commonly used standard sizes. **T-9-47**

## Guiderol Bearings

McGill Mfg. Co., Valparaiso, Ind., announces a cageless roller bearing—the Guiderol—the outer race of which is constructed with a tapered guide rail on the inside diameter. The rollers are grooved to match the guide rail and retained by a snap ring over the O.D. of the inner race.

As constructed, it is claimed that the rollers cannot skew and remain in a cocked condition. Elimination of all end washers further give support to the full width of the races and further permit use of extra-long rollers. **T-9-48**

# North East West South IN INDUSTRY

Shareholders of **The Oster Manufacturing Co.** recently elected **T. S. Bonnema** a director of the company. Starting as a stock clerk at Oster 28 years ago, Mr. Bonnema was made vice-president in charge of production in 1944.

According to recent announcement from **The R. K. LeBlond Machine Tool Co., Robert E. LaBonde** has been named advertising and export manager of that company succeeding B. N. Brockman, Jr., who joined The Oliver H. VanHorn Co.

**N. G. Sixt** of Niagara Falls, N. Y., has been named technical assistant to Fred P. Hauck, vice-president of the **Michigan Abrasive Co.** Mr. Sixt is a former Carborundum process engineer.

Announcement from **Firth Sterling** opening of **The Kenilworth Steel Co.** at Kenilworth, N. J., offering steel warehouse service. Products to be stocked initially are in the flat rolled metal category.

Announcement from **Fifth Sterling Steel & Carbide Corp.** has named **Louis DeMarco** as sales engineer. Mr. DeMarco, who has had experience with carbides for the past 19 years, has authored several tool design articles.

**Douglas A. Kuhna** has been appointed chief engineer of the **J. N. Fauver Company, Inc.** Following his discharge from the Air Force after the war, Mr. Kuhna entered Michigan College of Mining and Technology from which he was graduated last year with a Bachelor of Science degree in mechanical engineering.

Recent election by the board of directors of **Jessop Steel Co.** has made **Frank B. Rackley**, at the age of 33, the youngest president of a steel producing company in the country. Mr. Rackley, who joined Jessop in 1948, formerly was associated with Carnegie Illinois Steel Co.

**Tungsten Carbide Tool Co.** has been sold by Michigan Tool Co. to **A. E. Tozer**, general manager of the company since its founding in 1928. It is expected that the purchased company will be moved sometime in September into its own building now under construction at 26250 West Seven Mile Rd., Detroit.

**Carl Voorhies** has been named chief engineer of the valve tappet division of **The Chicago Screw Company**. Mr. Voorhies formerly was consultant to several automotive manufacturers as well as having spent a number of years in specialized valve gear work.

The board of directors of **The Monarch Machine Tool Co.** has approved an expansion program amounting to half million dollars for additions to plant and equipment. This will be the eighth expansion to be made in the Monarch plant since 1940.

**E. J. Kolb** has been made manager of export sales, Crucible Steel Company of America. Mr. Kolb, who has been associated with Crucible for 21 years, has been an assistant manager of export sales for the past nine years.

**The Kirk & Blum Manufacturing Co.**, Cincinnati, recently acquired the entire plant and property of **The Cincinnati Planer Co.** It is expected that the purchasing firm will occupy the plant about the end of the year.

**Fred M. Gillies** recently was elected to the position of executive vice president of **Acme Steel Co.** by the company's board of directors. Prior to joining Acme Steel a few months ago, Mr. Gillies for a number of years was works manager for Inland Steel Co.

**Everett M. Hicks** has been appointed manager of the grinding machine division, **Norton Co.**, and **Walter G. Johnson** was named manager of research and engineering of the division. Mr. Hicks, who joined Norton in 1937, assumes managerial duties of Frank W. Smith, vice-president and former manager. Mr. Johnson, who has been with the company since 1927, was formerly assistant chief engineer of the grinding machine division. He succeeds Albert G. Belden who retired.

**R. L. Peaslee** has joined the Wall **Colmonoy Corp.** as development engineer. Prior to his present affiliation, Mr. Peaslee was employed by the Wright Aeronautical Corp. as metallurgist handling specifications, development and control processes.

The name of **The Adamant Tool Co.** of Bloomfield, N. J., eastern subsidiary of Wheel Trueing Tool Co., Detroit, has been changed to **Wheel Trueing Co. of New Jersey.**

John N[illegible], engineer at Commercial Shearing & Stamping, received $1,000 first prize in the "Economy in Production" contest sponsored recently by The Ohio [illegible]ankshaft Co. Mr. Nelson's entry involved using the company's heating equipment for brazing hydraulic cylinders used on farm and construction machinery.

Judges for the contest included editors of the major technical magazines, among them *The Tool Engineer*.

**William J. Millett**, assistant to the vice-president in charge of manufacturing, has been named works manager of Holyoke Works, **Worthington Pump and Machinery Corp.**, replacing E. M. Detwiler who has resigned. Mr. Millett has been associated with Worthington for 37 years.

**Thorn L. Mayes** was appointed manager of the Lynn Motor engineering division responsible for engineering of all motors manufactured at the Lynn works.

## *Coming Meetings*

Sept. 18-22, Fifth National instrument exhibit, **Instrument Society of America**; Memorial Auditorium, Buffalo, N. Y.

Sept. 19-21, **American Society of Mechanical Engineers**; Hotel Sheraton, Worcester, Mass.

Sept. 26-29, 1950 Iron and Steel Exposition in conjunction with the annual convention of the **Association of Iron and Steel Engineers**; Cleveland Public Auditorium, Cleveland.

Sept. 27-29, 51st annual convention, **National Metal Trades Assn.**; Hotel Commodore, New York.

Oct. 12-13, **Gray Iron Founders' Society**, 22nd Annual Meeting; Netherlands Plaza Hotel, Cincinnati.

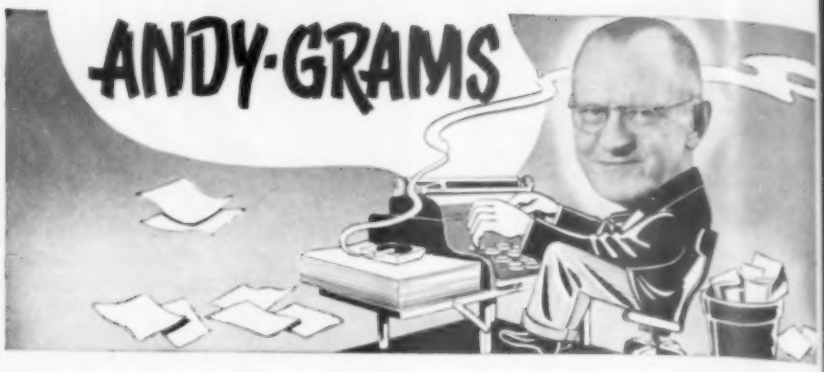
Oct. 23-27, National Metal Congress and Exposition sponsored by **American Society for Metals**; International Amphitheatre, Chicago.

Oct. 24-25, Third biennial Materials Handling Conference, sponsored by **Westinghouse**; Hotel Statler, Buffalo.

## OBITUARY

**Charles N. Safford**, president and director of the Lovejoy Tool Co., died suddenly in Burlington, Vt. Co-founder of the Lovejoy company in 1917, Mr. Safford held the position of treasurer until he assumed the presidency in 1948.

**W. H. Winans** has been elected vice-president—industrial relations, **Union Carbide and Carbon Corp.**, according to recent announcement. Mr. Winans has been concerned with industrial relations activities since he joined the National Carbon Div. of the corporation 34 years ago.




An open letter to Generalissimo Josef Stalin, USSR.

Dear Joe:

As you may infer from the informal address, I'm a friendly guy and, if somewhat familiar on short acquaintance, it goes both ways. So you go right ahead and call me Andy—that is, provided you're also friendly which we over here would like to believe only right now we're a mite dubious a/c the names you've been calling us of late, like being imperialists and war mongers. In fact, we're downright suspicious.

And y'know, such feelings are entirely contrary to our nature; if anything, we're inclined to be overly trusting and, in a gentleman's game, sometimes fail to cut the cards before the deal. And as far as your folks are concerned, I think they're okay at heart only they've been high-pressured into signing on the dotted line before they had a chance to read the fine print.

What I'm getting at, I got to thinking of you t'other night when, out for a drive with friend wife, I got caught in a traffic jam that extended bumper to bumper as far as you could see. Seems that a mile-long freight, loaded with food, had caught up with a train loaded with refrigerators, and that was blocked by a trainload of washing machines which, in turn, was held up—but, why go on? Enough to say that it was one heluva jam!

At that, it was a mere local trickle compared to automotive traffic that runs like broad rivers all over these United States. And Joe, who do you suppose owns all those millions and millions of nice shiny cars? Well, I'll tell you. Outside of farmers, merchants, tool engineers and a minority of millionaires—whom, incidentally, you'd find to be regular guys—those cars are mostly owned by American factory hands who, in addition to getting plenty to eat, also consume the bulk of all manufactured goods. Workers live well, in America.

Like I said, I got to thinking of you and wished you had been here to see things for yourself. Because if you had, like as not you'd be right happy to leave well enough alone and let us keep on making gadgets for home consumption instead of converting to a line of export goods the nature of which I'd rather not mention in a friendly letter.

As it is, Joe, don't go laying any heavy bets a/c our slow start in Korea. That's the way we are, always starting slow and behind the 8-ball at that but usually winding up in a heluva hurry. Not that I'm boasting, y'understand; I'm just telling you. But then, you should know, having been there when a couple of late adversaries threw the white towel in the ring.

Of course, they weren't smart like you in putting satellites to fronting "diversions" intended to becloud the real issue but like yourself they overlooked the American "second front"—production—when casing the layout. And that's where they made an awful mistake!

But, that wasn't their biggest mistake by a long shot. What they really overlooked was that a mere fraction of the moneys expended on war would have assured the economic security of their people—yes, of all people!—for untold generations. As it was, they plunged their own people into pauperism besides raising hob with my income tax.

As for charging us with imperialism, Joe, take my advice and forget that line of bunk which ain't fooling nobody no how—at least not the DP's who flee Utopia for better living in the U.S.A. Just for the record, however, I'm going to take you back a bit into American history and I don't mean back to when Leif Ericson discovered Chicago or the time we took the country from the Indians who now drive gilded Cadillacs a/c revenue from oil wells and moccasins made produced in Brockton.

No, we'll just go back to the Louisiana Purchase, when we paid Nap Bonaparte and Don Habsburg *beau coup* dubloons for their acres, then on to Alaska, for which one of your late tsars got $7 million in gold—no inflation. A bit later Hawaii joined the U.S.A. voluntarily and we paid the Danes $25 million for the Virgin Islands although I'll admit to some shrewd Yankee horse trading in that deal.

Now, in case you're all het to say that we grabbed land from Mexico back in 1848, let me tell you that 'tain't so. The Texans did that, all by 'emselves except for some help from Davy Crockett of Tennessee (don't want to get them Texans to bragging, y'know) and, after founding the Lone Star State, joined the Union of their own accord.

In 1898 when Teddy Roosevelt licked the Dons single-handed himself except for an 8th cousin of mine twice removed and some other guys we could have taken the Spanish West Indies as spoils of the victory. Instead we paid ex-king Alfonso's kid some $20 million in whatever's the antonym for indemnity and, on top of setting Cuba free, wrote the whole thing off by giving the Filipinos their islands as soon as they were ready for self government. And outside of temporary policing, I'll challenge you to point to an inch of territory acquired by conquest in the late world wars. And you call that imperialism!

If we were the land grabbers you say you'd think our immediate neighbors'd be scaredtohell of us, instead of which there's nary a fort along the entire stretches of the Mexican or Canadian borders. You want to cross the line for a shot of mescal or Canadian Club all they ask is where you were born, and if you're okay you get the green light (By the way, Joe, don't go getting any ideas about undefended borders, we and our neighbors being like 12 o'clock when it comes to repelling boarders).

With regard to this war mongering your public relations is blatting about, it smacks too much of the iron pot calling the stainless steel kettle black. However, I'll remind you that Uncle Sam turned the other cheek plenty before slapping back at *der Phewrer*, and that outside of some export goods for our friends—yourself included at the time—we were busily making home appliances when Togo sneaked up on Pearl Harbor. That's what we'd like to keep on doing now only for these diversions which ain't fooling us any. We're used to detours by now. Anyway, you might read up on the guy who could see the mote in his neighbor's eye despite the beam in his own.

But enough of that! Tell you what, Joe, let's quit this feudin' and name calling and, before it's too late, let's get together sociable like and agree on a policy of live and let live for everybody. A pact phrased in plain language, I mean; t'ell with this diplomatic double-talk that gets nobody nowhere fast just like Jake Malik's vetoes.

Be smart, Joe! After all, you've a golden opportunity to go down in history as the guy who made your country a land of peace and plenty, so don't go blowing your chances the way Mussolini and Hitler did. Any statues dedicated to the memory of those slap-happies will only show the heels. Trouble with them guys, they got cocky after flattening some flyweights and winning a few rounds on points from battle-weary heavyweights, and then decided to challenge the Champ. And look what happened!

Hoping this finds you in a responsive mood I am

Informally yours

*Andy*

# TECHNICAL SHORTS

Standard nomenclature to clarify the designation of aluminum sheet and plate has been adopted by the sheet division of The Aluminum Association.

According to the standard, "Plate" indicates a solid section rolled to a thickness of 0.250 in. and heavier in rectangular form with either sheared or sawed edges. "Sheet" is a solid section rolled to a thickness range of 0.006 in. to 0.249 in. inclusive, supplied with sheared, slit, or sawed edges. Subdivided under the latter, "flat sheet" connotes rectangular form with sheared, slit, or sawed edges which may be flattened by any standard method; while "coiled sheet" is furnished in rolls or coils with slit edges. Heretofore, the terms "strip" and "coiled sheet" were applied interchangeably to the same product, but the present nomenclature officially recognizes the latter.

A unique metal inspection process known as Dy-Chek has been developed by scientists at The Turbodyne Corp., subsidiary of Northrop Aircraft, Inc., as an aid to manufacturers and users of high-strength precision-built machinery and equipment.

A red penetrant dye, together with other liquids is applied to the surface of a suspected metal causing a crack or other opening to "bleed" in telltale scarlet lines. Through this process, it is said that the presence of cracks or other flaws too small to be seen even with a magnifying glass are clearly indicated.

Researchers point out that the process may be used by an inspector or skilled mechanic.

Chief advantages claimed for the method are its simplicity, relative inexpensiveness, its application to both ferrous and nonferrous metals, its portability and accuracy.

"Teflon" tetrafluoroethylene resin, an industrial plastic said to be highly resistant to chemicals and heat and excellent as an insulating material, is being turned out in commercial production at a recently expanded unit of the Du Pont Company's plastics plant near Parkersburg, W. Va.

According to its makers, Teflon offers a combination of chemical inertness, heat-resistance and insulating properties available in no other single material. Thus it may be used as corrosion-proof gaskets and valve packings that are essentially permanent, unless mechanically damaged; will withstand continuous temperatures up to 500 deg F; and also has a non-adhesive property making it valuable as an aid in processing sticky materials.

Manufacture of Teflon tetrafluoroethylene resin at Parkersburg begins with Freon 22 fluorinated hydrocarbon, a gas, as the raw material. This is broken down by heat to yield tetrafluoroethylene monomer, which is purified by distillation and then reacted to produce Teflon by a process of uniting the molecules.

Embodied in the Parkersburg plant is Teflon manufacturing knowhow accumulated by DuPont research in the last seven years. Manufacturing economies built into the unit have made price reductions possible to a cost of less than half the original price.

A national awards program, with $1,000 in cash prizes offered for technical papers dealing with new designs, redesigned steel castings, conversions and advanced uses for steel castings, including improved materials and methods applications to meet specific engineering problems, has been instituted by Steel Founders' Society of America.

Basic aim of the program, according to announcement from the Society headquarters, is to stimulate unbiased and original thinking and practical applications in regard to parts or products which can be made advantageously as steel castings.

Restudy of present designs for castings is encouraged to determine whether advantages are possible through change of materials, methods or design, as well as development of new applications or uses including selection of material and methods to best meet engineering, manufacturing and sales requirements.

An award of $300 tops the 15 prizes for the paper adjudged most useful.

Processes for making metal castings with phenolic resins and sand, cited as revolutionary advances in that industry by spokesmen of the Monsanto Chemical Company's plastics division, were displayed at this year's Foundry Show.

Developed in Germany during the war, the popularly called "C" process is primarily a carefully mixed layer of fine sand and phenolic resin cured over a hot metal pattern to give a thin shell. Two shells are clamped together, placed in a box of steel shot for reinforcement, and metal poured for casting.

Several advantages are claimed over old processes including the elimination of approximately 95 percent of the sand usually used. Porousness of the thinner phenolic-sand shell allows gases to escape quickly rather than build up as a pressure in the mold. In addition, it is said that a number of finishing operations may be eliminated due to smoother surfaces.

MACHINING CUT-OFF BAR STOCK WITH...

# *Regular Production* TOOLING ON THE POTTER & JOHNSTON 5D AUTOMATIC

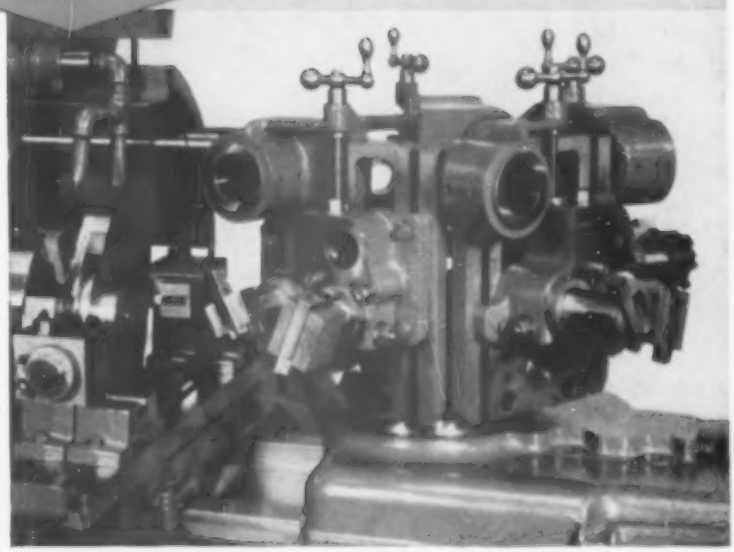
...PRODUCES PRECISION WORK LIKE THIS IN A GREAT VARIETY OF SIZES

**PROBLEM** — To manufacture a general line of sprockets within precision limits, in a wide range of sizes, on a quantity basis, with the greatest economy.

**SOLUTION** — The P&J 5D Powerflex AUTOMATIC, tooled with P&J solid and adjustable Tool Holders . . . Turning Stems of the solid and micrometer types . . . Turret Bushings for boring bars . . . Boring Bar Holders . . . and Cross Slide Blocks. All of these Tools are regular production tools, designed by P&J to work most effectively in conjunction with the automatically controlled movements of the Turret and Cross Slide.

Twenty-one drilling, boring, turning and facing cuts with regular P&J Tools, and two grooving cuts with one form tool, complete the sprocket in two high speed operations.

**RESULT** — Economy in tooling . . . economy in upkeep . . . economy in work handling . . . economy in labor costs, with one operator easily handling two machines.



**SUGGESTION** — Is *your* Tooling engineered for maximum economy? Get a P&J Tooling Recommendation and a detailed report on this P&J Time Estimate Sheet — then compare. Send sample parts or prints.

**P&J** 50 YEARS' EXPERIENCE IN TOOLING FOR

*Precision + Productivity + Economy*

**POTTER & JOHNSTON CO.**

PAWTUCKET, R. I.

subsidiary of PRATT & WHITNEY

Division Niles-Bement-Pond Company

P&J


# ANOTHER DoALL Achievement
# GRIND VERTICALLY

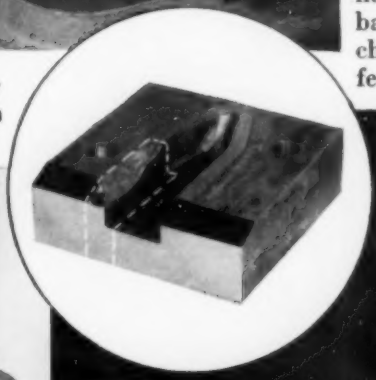
## To Machine Heat-Treated Steel

**Repair Broken Dies . . . Alter Finished Dies**
**Machine Hardened Materials . . . Cut Abrasive Materials**

The new DoALL Line Grind band gives you a new machining term—"vertical grinding." This band, on the DoALL Contour-matic, performs amazing operations saving thousands of dollars in repairing or altering finished, hardened dies. It's the first machine and only cutting tool combination that will do precision "vertical grinding" on inside, outside and contour cuts.

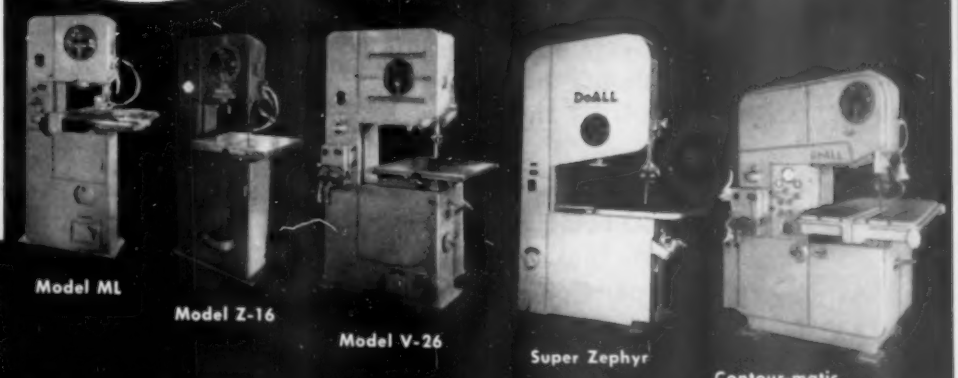
In the die shop there has always been a need for just such a cutting tool in order to meet a production run by saving valuable dies that become broken, warped or need last minute alterations. DoALL Line Grind bands, having hundreds of abrasive segments mold-welded to the steel band, are available only for the DoALL Contour-matic machine which has the rigidity, pressure coolant and hydraulic feeding necessary for efficient Line Grinding operations.

Die quickly repaired by removing broken section



DoALL Line-Grind Band Tool

**At the A. S. M. Metal Congress in Chicago**
**SEE** This new machining method "Line Grinding" and DoALL's complete line of Band Machines, surface grinders and gaging instruments in operation . . . Oct. 23-27, 1950
DoALL Exhibit Booth No. 606




Model ML
Model Z-16
Model V-26
Super Zephyr
Contour-matic
The first band machine tool with complete hydraulic operation

# DoALL
## BAND MACHINES and TOOLS for EVERY PURPOSE


**27 KINDS—Band Cutting Tools**
for Line Milling, Line Grinding, Contour Sawing, Friction Sawing, Continuous Filing, Polishing, Honing
FOR DETAILS WRITE TO . . . . . .

The DoALL Company
Des Plaines, Ill., U.S.A.
Cable Address: DoALL, Des Plaines
Representatives in 36 Countries
DoALL Stores in Key Cities

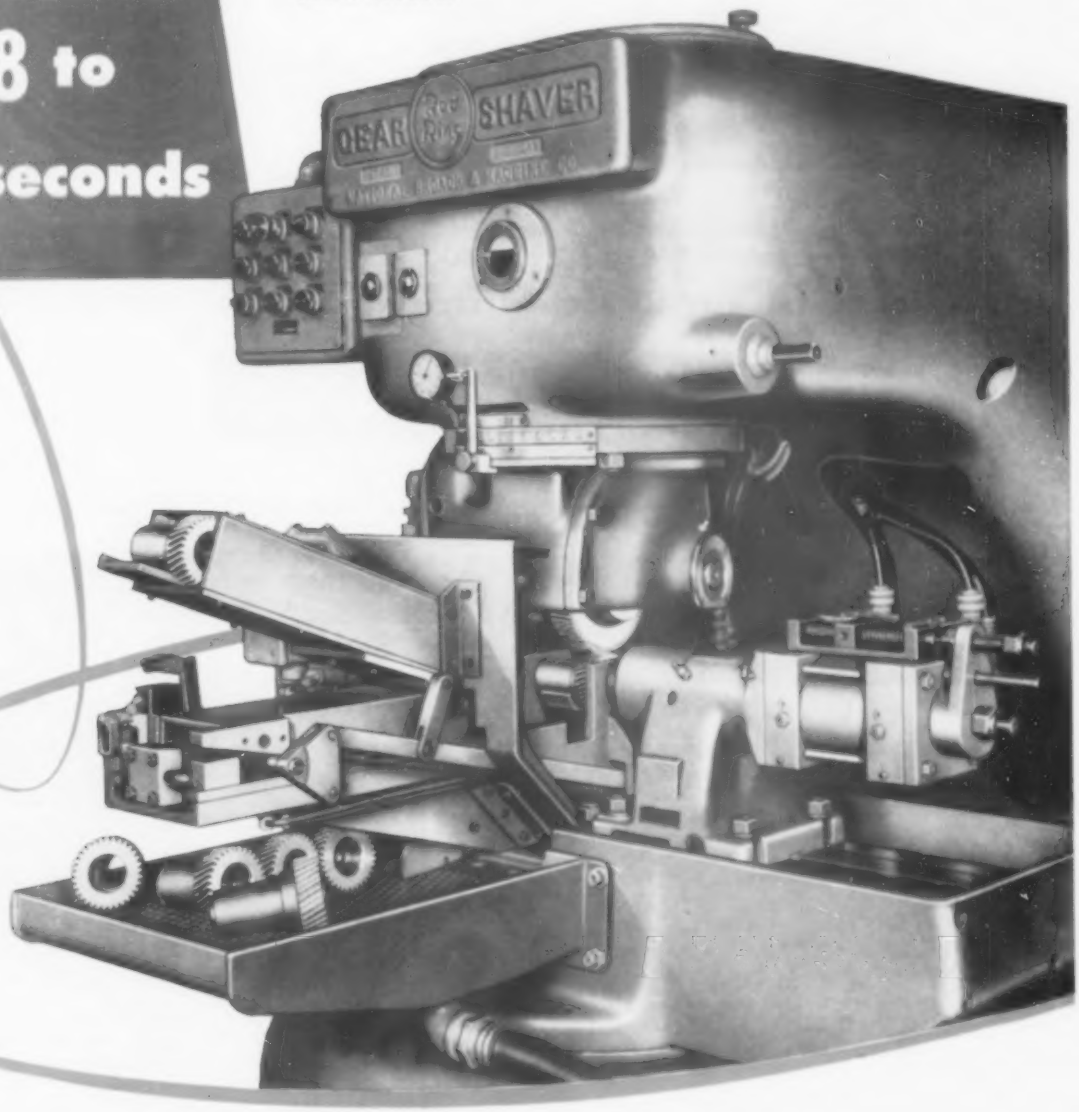
# Transmission Gears

## shaved in 18 to 22 seconds

The gear on this automatic transmission reverse drive sleeve is 2 5/8" in diameter with a 7/8" face, 33 teeth and 14 normal D.P.

It is being shaved on this Red Ring Diagonal Gear Shaving Machine equipped for fully automatic loading at a rate of from 165 to 200 per hour, removing .0025" to .0015" of stock on tooth thickness. Rates up to 300 per hour have been recorded on smaller automotive transmission gears.

Automatic loading gives you not only the highest production rates, but it also minimizes operator fatigue and assures extremely close tolerance gears with ordinary machine operators—no special skill is needed.




*WRITE FOR DESCRIPTIVE LITERATURE ON RED RING GEAR SHAVING AND AUTOMATIC LOADING*


**NATIONAL BROACH AND MACHINE CO.**

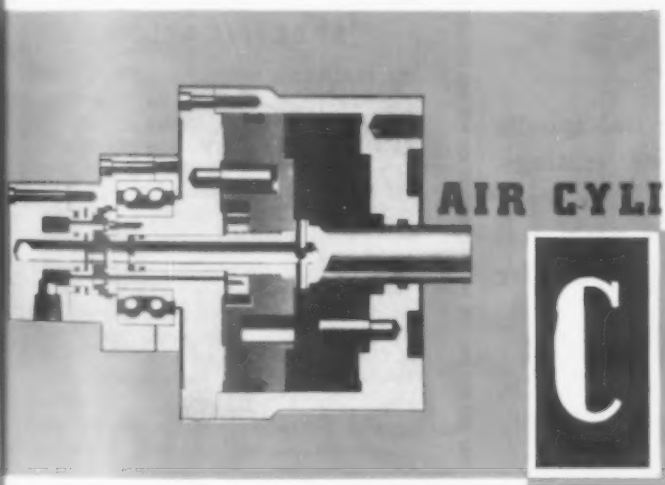
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT


## COST-CUTTING IS NOT AN ENJOYABLE SPECTATOR SPORT!

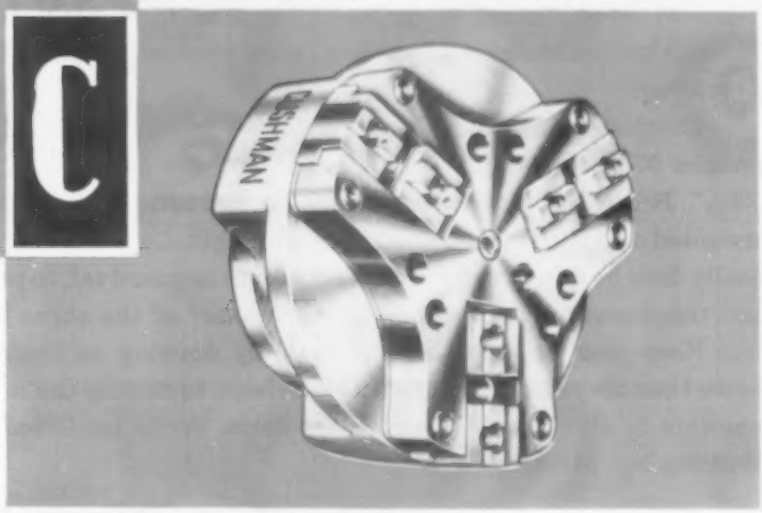
Of course, it's a great deal more interesting . . . and more profitable . . . to *lead* the way in getting your manufacturing costs down, than to have your competitor force you into it.

That is why we invite you to get the facts about ultra-modern Cushman Power Chucking methods and equipment NOW . . . without delay. Our engineering department is extremely busy showing a growing list of metal working shops how recent developments . . . like super-speed machining with Aluminum Body Power Chucks and Air Cylinders . . . can effect cost reductions that mean something in the final price structure. Write us at once for current bulletins or outline your tooling and production needs and we'll be glad to make recommendations.



**CUSHMAN**
*High speed*
ALUMINUM BODY
**AIR CYLINDERS** *and* **CHUCKS**

C




*Raise your Speed limits and lower your costs*

# CUSHMAN

THE CUSHMAN CHUCK CO.
Hartford 2, Connecticut

CUSHMAN (USO) MANUFACTURES A COMPLETE SERIES OF WRENCH OPERATED CHUCKS . . . WRITE FOR CATALOG 64

# New! Low Cost!

## BESLY No. 318—18"

## Bench Grinder for light, free-hand work


This compact, handy and inexpensive vertical spindle grinder handles a large volume of free-hand work: castings, forgings, stampings, plastics, etc., where only a little stock removal is required. All grinding is done in a horizontal plane. This assures easier handling, more production and safer operation.

Complete with 18" diameter abrasive wheel, this grinder weighs 575 pounds. The height is 31" and the overall width, 28½". Because of its compact, rugged construction, it is easily mounted on a bench or stand of suitable height. Disc dressing is easily done by quick removal of a section of the guard rail to permit the dresser arm to swing across the face of the abrasive.

Keep your production costs down by drawing on Besly's more than 50 years accumulated experience in finding the best answers to all types of grinding problems. Write for Grinder Bulletin No. 318-18.

### DIMENSIONS AND SPECIFICATIONS

| | |
|---|---|
| DIA. OF STEEL DISC WHEEL | 18" |
| ABRASIVE SIZE | 18" dia., 1" or 2" thick |
| END THRUST ON CENTER OF SPINDLE | 2000 lbs. |
| MOTOR | 5 h.p., 1160 r.p.m., 220/440 volt, 3 phase, 60 cycle, totally enclosed, fan cooled, ball bearing, Fairbanks-Morse Axial Air Gap |
| DRESSER | Radial arm with ball bearing dresser cutter |
| WHEEL GUARD RING | Removable |
| EXHAUST PIPE OUTLET | 4½" inside dia. |
| HEIGHT | 31" to top of dresser arm<br>17½" to top of tub |
| WIDTH | 28½" overall with dresser attachment<br>23½" dia. tub |
| APPROX. WEIGHT COMPLETE WITH ABRASIVE | 575 lbs. |
| APPROX. WEIGHT CRATED | 675 lbs. |
| OPTIONAL EQUIPMENT | Crossarm, pedestal, motor driven coolant pump, tank, and piping for wet grinding |


### BESLY-TITAN WHEELS

Just out — the new Besly-Titan booklet of abrasive wheels and discs — a valuable source of information on modern grinding wheels — up-to-date — authoritative. Includes full data on Besly-Titan Steelbacs that cut "down time". Write for your copy today!

**BESLY**

TAPS—the world's most accurate tap.

TWIST DRILLS AND REAMERS—Complete line for every need.

BESLY-TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job.

GRINDERS that reduce costs on every type of surface grinding.

CHARLES H. BESLY & COMPANY • 120 N. Clinton Street, Chicago 6, Illinois • Factory: Beloit, Wisconsin

FIRTHITE

## INDUSTRY STANDARDS CARBIDE TIPS AND BLANKS

# You can do it *Better, Faster, Cheaper* with *Firth Sterling*

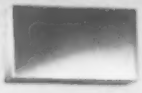
# FIRTHITE TIPS and BLANKS

**BETTER**—Firthite tips are manufactured to uniformly close tolerances. Rigid quality control from raw material to finished product assures the Firthite user of a cutting material of superior strength.

**FASTER**—Firthite tips permit the use of maximum machine speeds when cutting ferrous or non-ferrous metals and plastics.

**CHEAPER**—The superior quality of Firthite, the use of maximum machine speeds, and the "edge-wear and crater-resistant" features of Firthite combine to provide the Firthite user with the most economical sintered carbide.

## STANDARDS—STYLES 1000, 2000



STYLE 1000

STYLE 2000

STYLES 2000, 3000-4000

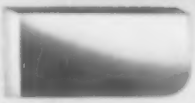
Tips furnished with following radii.

WIDTH
1/8" thru 1/4"
5/32" thru 3/8"
over 3/8"

RADII
1/8", 3/16", 1/4"

| DIMENSIONS IN INCHES | | | TIP NUMBER | | T-04, TA, T-16, H, HA | T-31 HE | Std Pkg. Qty. |
|---|---|---|---|---|---|---|---|
| Thickness | Width | Length | Style 1000 | Style 2000 | | | |
| 1/16 | 1/8 | 5/8 | 1010 | 2010 | All Sizes Stocked in These Grades | ** | 50 |
| | 3/16 | 1/4 | 1020 | 2020 | | * | 50 |
| | 1/4 | 1/4 | 1025 | 2025 | | * | 50 |
| | 1/4 | 5/16 | 1030 | 2030 | | * | 50 |
| 3/32 | 3/16 | 5/16 | 1040 | 2040 | | | 50 |
| | 3/16 | 1/2 | 1050 | 2050 | | | 50 |
| | 1/4 | 3/8 | 1060 | 2060 | | * | 50 |
| | 1/4 | 1/2 | 1070 | 2070 | | * | 50 |
| | 5/16 | 3/8 | 1080 | 2080 | | * | 50 |
| | 3/8 | 3/8 | 1090 | 2090 | | * | 25 |
| | 3/8 | 1/2 | 1100 | 2100 | | | 25 |
| | 7/16 | 1/2 | 1105 | 2105 | | | 25 |
| 1/8 | 3/16 | 3/4 | 1110 | 2110 | | | 25 |
| | 1/4 | 1/2 | 1120 | 2120 | | | 25 |
| | 1/4 | 5/8 | 1130 | 2130 | | | 25 |
| | 1/4 | 3/4 | 1140 | 2140 | | | 25 |
| | 5/16 | 7/16 | 1150 | 2150 | | | 25 |
| | 5/16 | 1/2 | 1160 | 2160 | | | 25 |
| | 5/16 | 5/8 | 1170 | 2170 | | | 25 |
| | 3/8 | 1/2 | 1180 | 2180 | | | 25 |
| | 3/8 | 3/4 | 1190 | 2190 | | * | 25 |
| | 1/2 | 1/2 | 1200 | 2200 | | * | 25 |
| | 1/2 | 3/4 | 1210 | 2210 | | | 25 |
| | 3/4 | 3/4 | 1215 | 2215 | | | 10 |
| 5/32 | 3/8 | 9/16 | 1220 | 2220 | | | 25 |
| | 3/8 | 3/4 | 1230 | 2230 | | | 25 |
| | 5/8 | 5/8 | 1240 | 2240 | | | 25 |
| 3/16 | 5/16 | 7/16 | 1250 | 2250 | | | 25 |
| | 5/16 | 5/8 | 1260 | 2260 | | | 25 |
| | 3/8 | 1/2 | 1270 | 2270 | | | 25 |
| | 3/8 | 5/8 | 1280 | 2280 | | | 25 |
| | 3/8 | 3/4 | 1290 | 2290 | | | 25 |
| | 7/16 | 5/8 | 1300 | 2300 | | | 25 |
| | 7/16 | 13/16 | 1310 | 2310 | | | 10 |
| | 1/2 | 1/2 | 1320 | 2320 | | | 25 |
| | 1/2 | 3/4 | 1330 | 2330 | | | 10 |
| | 3/4 | 3/4 | 1340 | 2340 | | | 10 |

## STANDARDS—STYLES 0000, 1000, 3000, 4000



STYLE 0000

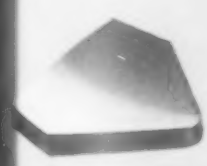
STYLE 3000 (left hand) shown below

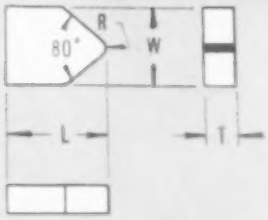
STYLE 4000 (right hand)

| DIMENSIONS IN INCHES | | | TIP NUMBER | | | | T-04, TA, T-16, H, HA | Std Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|
| Thickness | Width | Length | Style 0000 | Style 1000 | Style 3000 | Style 4000 | | |
| 1/4 | 3/8 | 9/16 | | 1350 | 3350 | 4350 | All Sizes Stocked in These Grades | 25 |
| | 3/8 | 3/4 | | 1360 | 3360 | 4360 | | 10 |
| | 7/16 | 5/8 | | 1370 | 3370 | 4370 | | 10 |
| | 1/2 | 3/4 | 0380 | 1380 | 3380 | 4380 | | 10 |
| | 9/16 | 1 | 0390 | 1390 | 3390 | 4390 | | 10 |
| | 5/8 | 5/8 | | 1400 | 3400 | 4400 | | 10 |
| | 3/4 | 3/4 | | 1405 | 3405 | 4405 | | 10 |
| | 3/4 | 1 | 0410 | 1410 | 3410 | 4410 | | 10 |
| 5/16 | 7/16 | 5/8 | | 1420 | 3420 | 4420 | | 10 |
| | 7/16 | 15/16 | | 1430 | 3430 | 4430 | | 10 |
| | 1/2 | 3/4 | | 1440 | 3440 | 4440 | | 10 |
| | 1/2 | 1 | | 1450 | 3450 | 4450 | | 10 |
| | 5/8 | 1 | 0460 | 1460 | 3460 | 4460 | | 10 |
| | 3/4 | 3/4 | | 1470 | 3470 | 4470 | | 10 |
| | 3/4 | 1 | | 1475 | 3475 | 4475 | | 5 |
| | 3/4 | 1-1/4 | 0480 | 1480 | 3480 | 4480 | | 5 |
| 3/8 | 1/2 | 3/4 | | 1490 | 3490 | 4490 | | 10 |
| | 1/2 | 1 | 0500 | 1500 | 3500 | 4500 | | 10 |
| | 5/8 | 1 | 0510 | 1510 | 3510 | 4510 | | 5 |
| | 3/4 | 1-1/4 | | 1520 | 3520 | 4520 | | 5 |
| | 3/4 | 1-1/2 | 0525 | 1525 | 3525 | 4525 | | 5 |
| 1/2 | 3/4 | 1 | | 1530 | 3530 | 4530 | | 5 |
| | 3/4 | 1-1/4 | 0540 | 1540 | 3540 | 4540 | | 5 |
| | 3/4 | 1-1/2 | 0550 | 1550 | 3550 | 4550 | | 5 |



## STYLE 5000—POINTED and ROUND NOSE TOOL TIPS

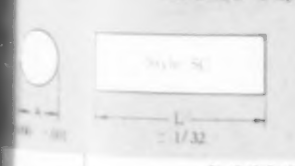


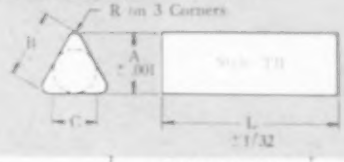


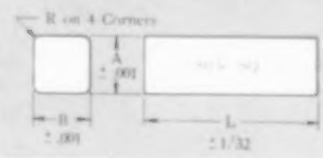

| DIMENSIONS IN INCHES | | | TIP NUMBER | T-04, TA, H, HA | Standard Package Quantity |
|---|---|---|---|---|---|
| T | W | L | | | |
| 1/16 | 1/4 | 5/16 | 5030 | | 50 |
| 3/32 | 5/16 | 3/8 | 5040 | | 50 |
| 3/32 | 3/8 | 1/2 | 5100 | ALL SIZES | 25 |
| 3/32 | 7/16 | 1/2 | 5105 | STOCKED IN | 25 |
| 1/8 | 1/2 | 1/2 | 5200 | THESE GRADES | 25 |
| 5/32 | 5/8 | 5/8 | 5240 | | 25 |
| 3/16 | 3/4 | 3/4 | 5340 | | 10 |
| 1/4 | 1 | 3/4 | 5410 | | 10 |

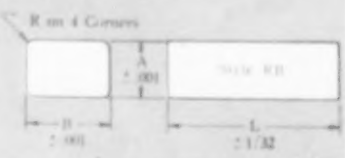
## MECHANIGRIPT INSERTS FROM STOCK
## STYLES SC, TB, SQ, RB

FIRTHITE Mechanigript inserts are designed for use in Round, Triangular, Square and Rectangular Mechanigript "Vertically Hold" Tools.



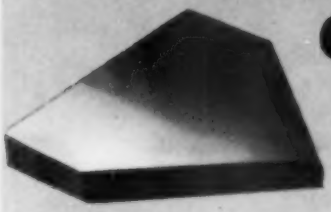



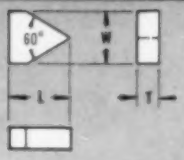

| Insert No. | DIMENSIONS | | | | | GRADES STOCKED | | | | Std Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | L | R | T-16 | TA | HA | H | |
| [illegible] | 1/8 | | | 1-1/2 | | * | * | * | | 2 |
| [illegible] | 1/2 | | | 1-1/2 | | * | * | * | | 2 |
| [illegible] | 3/32 | 3/87 | 1/4 | 1-1/2 | 1/32 | * | * | * | | 4 |
| [illegible] | 1/2 | 3/81 | 3/8 | 1-1/2 | 3/64 | * | * | * | | 4 |
| [illegible] | .187 | .774 | 1/2 | 1-1/2 | 1/16 | | * | * | | 2 |

| Insert No. | DIMENSIONS | | | | | GRADES STOCKED | | | | Std Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | L | R | T-16 | TA | HA | H | |
| SQ-12122 | 3/8 | 3/8 | | 1-1/2 | 1/32 | * | * | * | | 4 |
| SQ-16123 | 1/2 | 1/2 | | 1-1/2 | 3/64 | | * | * | * | 4 |
| SQ-24124 | 3/4 | 3/4 | | 1-1/2 | 1/16 | | | | | 4 |
| RB-6123 | 3/8 | 3/4 | | 1-1/2 | 1/16 | | * | | * | 4 |

# BUY PACKAGES AND SAVE 5% to 12½%

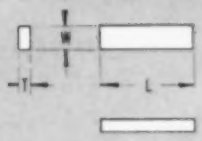
## STYLE 6000 60° THREADING TOOL TIPS






| DIMENSIONS IN INCHES | | | TIP NUMBER | GRADES STOCKED | Standard Package Quantity |
|---|---|---|---|---|---|
| T | W | L | | T-04, TA, HA | |
| 3/32 | 5/16 | 3/8 | 6080 | | 50 |
| 3/32 | 3/8 | 1/2 | 6100 | ALL SIZES | 25 |
| 1/8 | 1/2 | 1/2 | 6200 | STOCKED IN | 25 |
| 5/32 | 5/8 | 5/8 | 6240 | ABOVE GRADES | 25 |
| 3/16 | 3/4 | 3/4 | 6340 | | 10 |

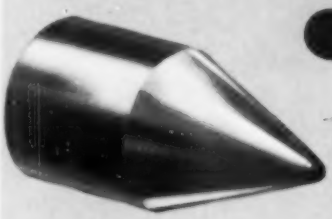
## STYLE ST SCRAPER TIPS

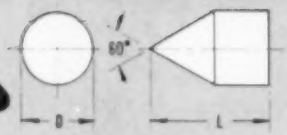



FURNISHED AS STANDARD IN GRADE HA

| DIMENSIONS IN INCHES | | | TIP NUMBER | Standard Package Quantity |
|---|---|---|---|---|
| T | W | L | | |
| 3/64 | 3/32 | 1 | ST-1 | 50 |
| 1/16 | 1/4 | 1 | ST-2 | 25 |
| 3/32 | 1/4 | 1 | ST-3 | 25 |
| 1/8 | 1/4 | 1-1/4 | ST-4 | 25 |

## STYLE LC LATHE and GRINDER CENTER TIPS



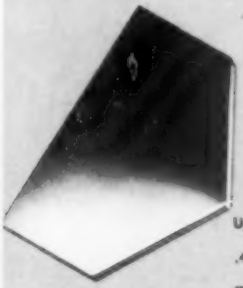


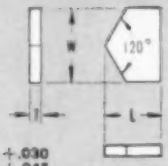

O.D. Centerless Ground W +.000 −.002

FURNISHED AS STANDARD IN GRADE H

| DIMENSIONS IN INCHES | | STANDARD TAPER NUMBER | | | TIP NUMBER | Standard Package Quantity |
|---|---|---|---|---|---|---|
| Diameter | Length | MORSE | JARNO | BROWN & SHARPE | | |
| 1/4 | 7/16 | 1 | 4, 5 | 5, 6 | CT-40 | 10 |
| 5/16 | 9/16 | 2 | | 7 | CT-50 | 10 |
| 3/8 | 11/16 | | 6, 7 | 8 | CT-60 | 10 |
| 1/2 | 7/8 | 3, 4 | 8, 9, 10, 11 | 9, 10 | CT-80 | 5 |
| 5/8 | 1-1/16 | 5, 6 | 12, 13, 14 | 11, 12 | CT-100 | 5 |
| 3/4 | 1-1/4 | | | 13 | CT-120 | 5 |
| 7/8 | 1-3/8 | 7 | | | CT-140 | 5 |

## STYLE MD MASONRY DRILL TIPS





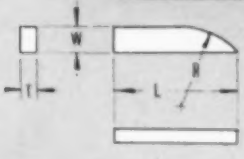

W
Up to .400 +.030 +.045
.400 to 1.040 +.030 +.050
Over 1.040 +.035 +.075

L
Up to 3/8 +.015 −.000
Over 3/8 +.020 −.000

| For Drill Diam. | DIMENSIONS IN INCHES T | W* | L* | TIP NUMBER | Std. Pkg. Qty. | For Drill Diam. | DIMENSIONS IN INCHES T | W* | L* | TIP NUMBER | Std. Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/16 | .025/.030 | .208 | .208 | MD-3 | 50 | 11/16 | .081/.091 | .723 | .598 | MD-11 | 25 |
| 1/4 | .040/.045 | .270 | .270 | MD-4 | 50 | 3/4 | .081/.091 | .785 | .598 | MD-12 | 25 |
| 5/16 | .050/.060 | .338 | .368 | MD-5 | 50 | 7/8 | .081/.091 | .915 | .728 | MD-14 | 25 |
| 3/8 | .050/.060 | .400 | .368 | MD-6 | 50 | 1 | .081/.091 | 1.040 | .728 | MD-16 | 10 |
| 7/16 | .050/.060 | .468 | .468 | MD-7 | 25 | 1-1/8 | .081/.091 | 1.170 | .858 | MD-18 | 10 |
| 1/2 | .081/.091 | .535 | .472 | MD-8 | 25 | 1-1/4 | .112/.122 | 1.295 | .858 | MD-20 | 10 |
| 9/16 | .081/.091 | .597 | .472 | MD-9 | 25 | 1-1/2 | .112/.122 | 1.545 | 1.045 | MD-24 | 10 |
| 5/8 | .081/.091 | .660 | .598 | MD-10 | 25 | | | | | | |

*The width and length are supplied over-size as indicated above.

## STYLE RT REAMER TIPS




FURNISHED AS STANDARD IN GRADES HA AND T-16

| DIMENSIONS IN INCHES | | | TIP NUMBER | Std. Pkg. Qty. | DIMENSIONS IN INCHES | | | TIP NUMBER | Std. Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|---|
| T | W | L | | | T | W | L | | |
| 1/32 | 1/16 | 1/2 | RT-1 | 50 | 1/16 | 13/64 | 3/4 | RT-7 | 25 |
| 3/64 | 3/32 | 1/2 | RT-2 | 50 | 1/16 | 17/64 | 3/4 | RT-8 | 25 |
| 3/64 | 3/32 | 11/16 | RT-3 | 50 | 1/16 | 5/16 | 3/4 | RT-9 | 25 |
| 1/16 | 1/8 | 11/16 | RT-4 | 50 | 1/16 | 3/8 | 3/4 | RT-10 | 25 |
| 5/64 | 1/8 | 7/8 | RT-5 | 50 | 3/64 | 3/32 | 1 | RT-11 | 50 |
| 3/32 | 3/16 | 7/8 | RT-6 | 25 | | | | | |

R-192

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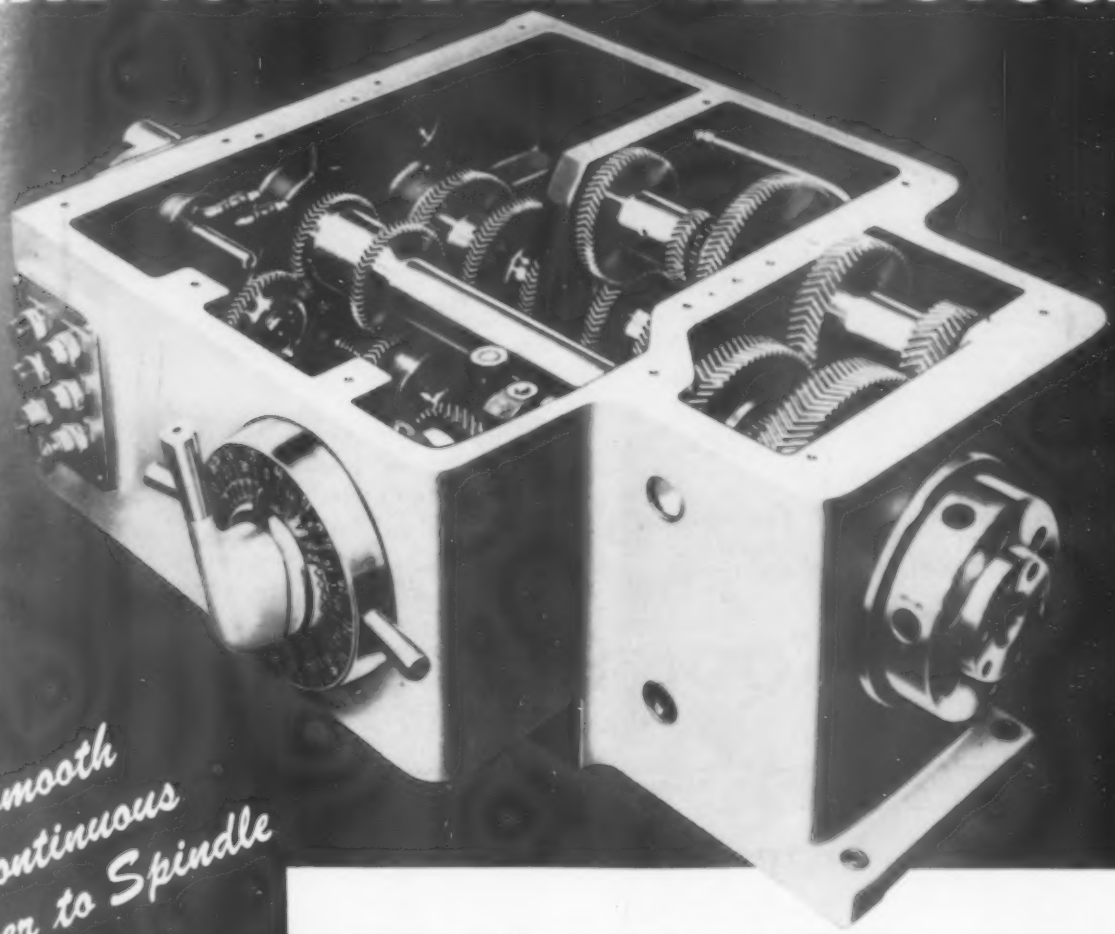
# SIDNEY'S 32 SPEED DIAL CONTROLLED HEADSTOCK



*Smooth Continuous Power to Spindle*

The herringbone gears in the Sidney headstock provide more tooth contact resulting in greater strength, smoother action with end thrust eliminated through the double opposed helix angles. Accurate tooth contour, gradual engagement and oblique lines of contact assure correct tooth action and reduces wear to minimum. This headstock also features a spindle mounting which automatically compensates for expansion caused by temperature rise. The ideal transmission for carbide tools. The herringbone geared headstock has been an exclusive Sidney feature since 1925.

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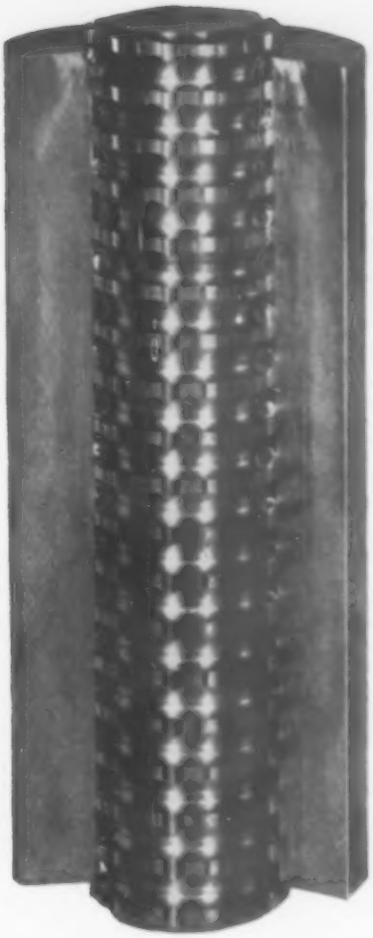
# What makes a broach GOOD?

At right, index and spacing checker for spline or serration broaches. Also checks lead. In front, special surface plate to check alignment. Note comparator in background for checking complex contours on broached samples.

Metallographic analysis of heat-treated specimens (taken at different radii on large broaches), precedes fabrication.

A complete chemical and physical lab provides facilities for metal analysis. Operated by trained technicians.

Test pieces produced during the grinding of involute splines on broaches are checked on this Michigan Tool involute checker.



Typical of Colonial's continuous research on chip characteristics and the effect of various factors such as material, pitch, breaker spacing, etc., is this study on "deep hole" spline broaching.

A **GOOD** broach is about the most inexpensive tool you can buy—based on the number of finished pieces which it will produce. On the same basis, a poor or mediocre broach can be a costly investment, no matter what you pay for it.

Colonial's ability to consistently design and produce **GOOD** broaches is no accident. It is a matter of constant vigilance—checking and re-checking at every stage—plus the finest of inspection "tools". Here are some of the facilities that make Colonial broaches **GOOD** broaches.

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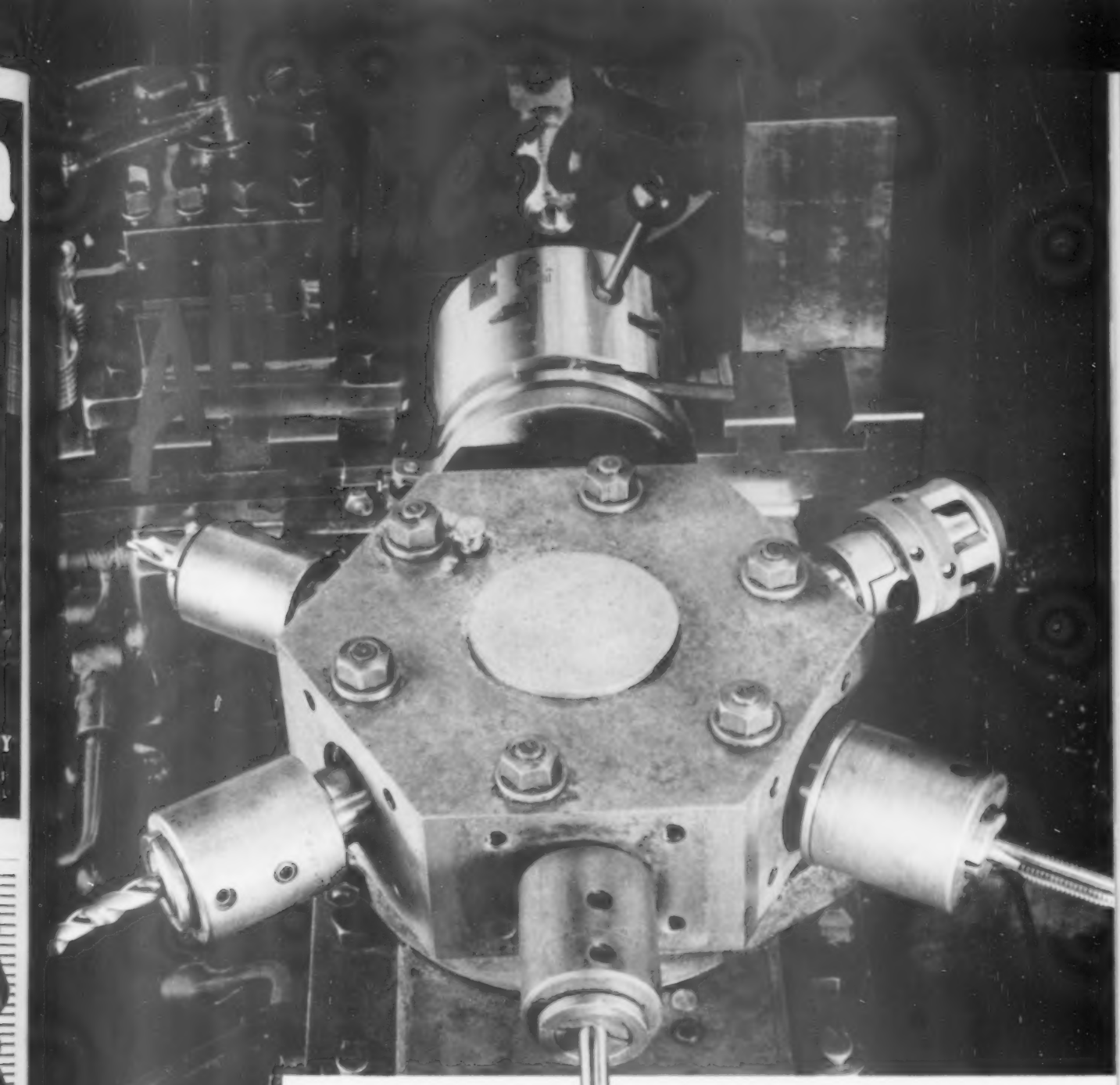
PIONEERS OF H.S.S. BROACHING

COLONIAL

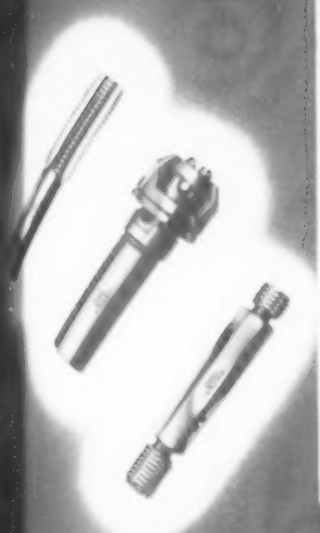
BROACH CO. DETROIT 13

*Colonial Makes* **GOOD** *Broaches*



# and gages too!

Yes, only GREENFIELD with its GEOMETRIC Division manufactures in its own plants, a complete line of Cutting Tools plus Gages! Yes, only GREENFIELD could duplicate the above tooling and top it off with all necessary Gages.



**REGULAR STOCK ITEMS**

| | Capacity From | To | | Capacity From | To |
|---|---|---|---|---|---|
| TAPS and COLLAPSING TAPS | 0-80 | 8½"-8 | DRILLS | #80 | 3½" |
| DIES and DIE HEADS | 0-80 | 6"-7 | REAMERS | 7/0 | 2½" |
| GAGES—THREAD | 0-80 | 1½"-6 | END MILLS | 1/16" | 2" |
| GAGES—PLAIN | .059" | 4.510" | | | |

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## GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

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all this with less power consumptio
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finely proportioned flutes and concent
webs are assured, chip disposal is facilitate
On deep hole drilling polished flutes are a MUS
on average jobs a PLUS. Don't be satisfied wi
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**BE SURE BUY GTD-AMPCO**

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GREENFIELD, MASSACHUSETTS

# LEHIGH H

## HIGH-CARBON, HIGH-CHROMIUM TOOL STEEL

# *For high-production dies*

*Photos Courtesy: Middlestadt Machine Co. Baltimore, Md.*

Here's a tool steel that's engineered for high-production tools and dies. Experienced toolmakers call it the aristocrat among tool steels.

## Quick Facts About LEHIGH H

**Maximum Wear.** Its high-carbon content makes it first choice wherever great resistance to wear is important. Use it for long runs.

**Close Tolerances.** Lehigh H is the ideal tool steel for maintaining split-hair accuracy. You can count on the very minimum change in size and shape during heat-treatment.

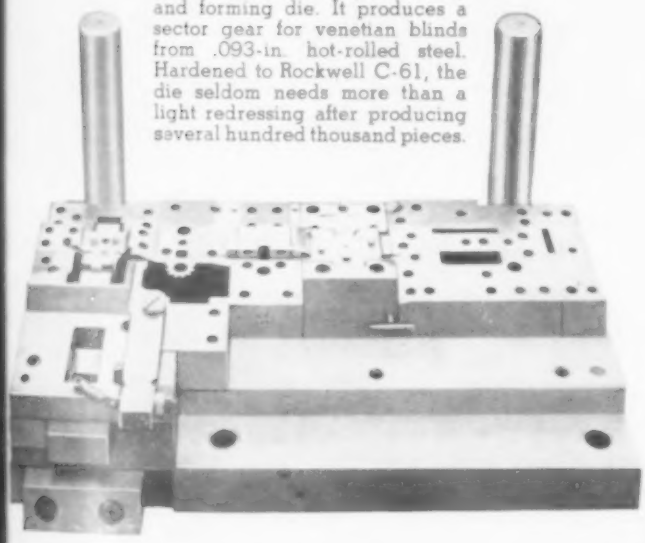
**Safe Hardening.** Lehigh H is cooled in still air from a hardening temperature of 1850 F. It eliminates cracking hazards for intricate dies, thin sections, short radii.

**Heavy Duty.** Lehigh H is extremely deep-hardening, even in large sections . . . and has high compressive strength for tools and dies subject to severe service.

**Wide Application.** Use it for tools and dies that blank, punch, form, draw, shear, and bend . . . for lamination dies, shear blades, wearing plates . . . master gages, bending rolls . . . and the like.

| **Typical Analysis:** | C | Cr | V | Mo |
|---|---|---|---|---|
| | 1.55 | 11.50 | 0.40 | 0.80 |

A trial in your own shop will convince you. Lehigh H is stocked by Bethlehem Tool Steel distributors in principal cities. The nearest Bethlehem sales office can give you full information.



Lehigh H is the key to long die life in this seven-stage blanking and forming die. It produces a sector gear for venetian blinds from .093-in. hot-rolled steel. Hardened to Rockwell C-61, the die seldom needs more than a light redressing after producing several hundred thousand pieces.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

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Oilgear Broaching Machines offer you many advantages as standard which are exclusive with Oilgear or are to be found elsewhere only at extra cost.

Oilgear Machines are often bought to replace other types of equipment and represent tremendous gains both in initial savings and in greatly increased production. This is true in the case of small factories where every capital investment must be carefully made, and in the case of large industrials where production is largely given over to semi-automatic and fully automatic machines, and unfailing dependability becomes just that much more vital. It will pay you to investigate what Oilgear Broaching Machines can do for you. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.

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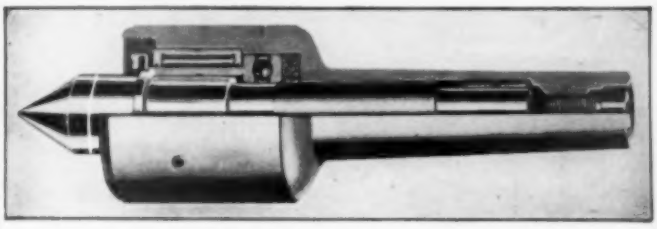

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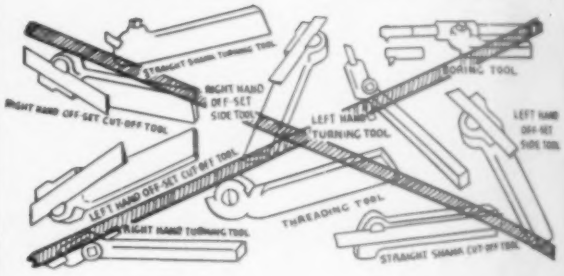
**NOT These**

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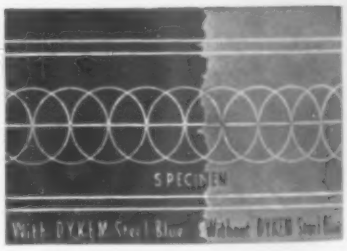


**Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief and at the same time prevents metal glare. Increases efficiency and accuracy.**

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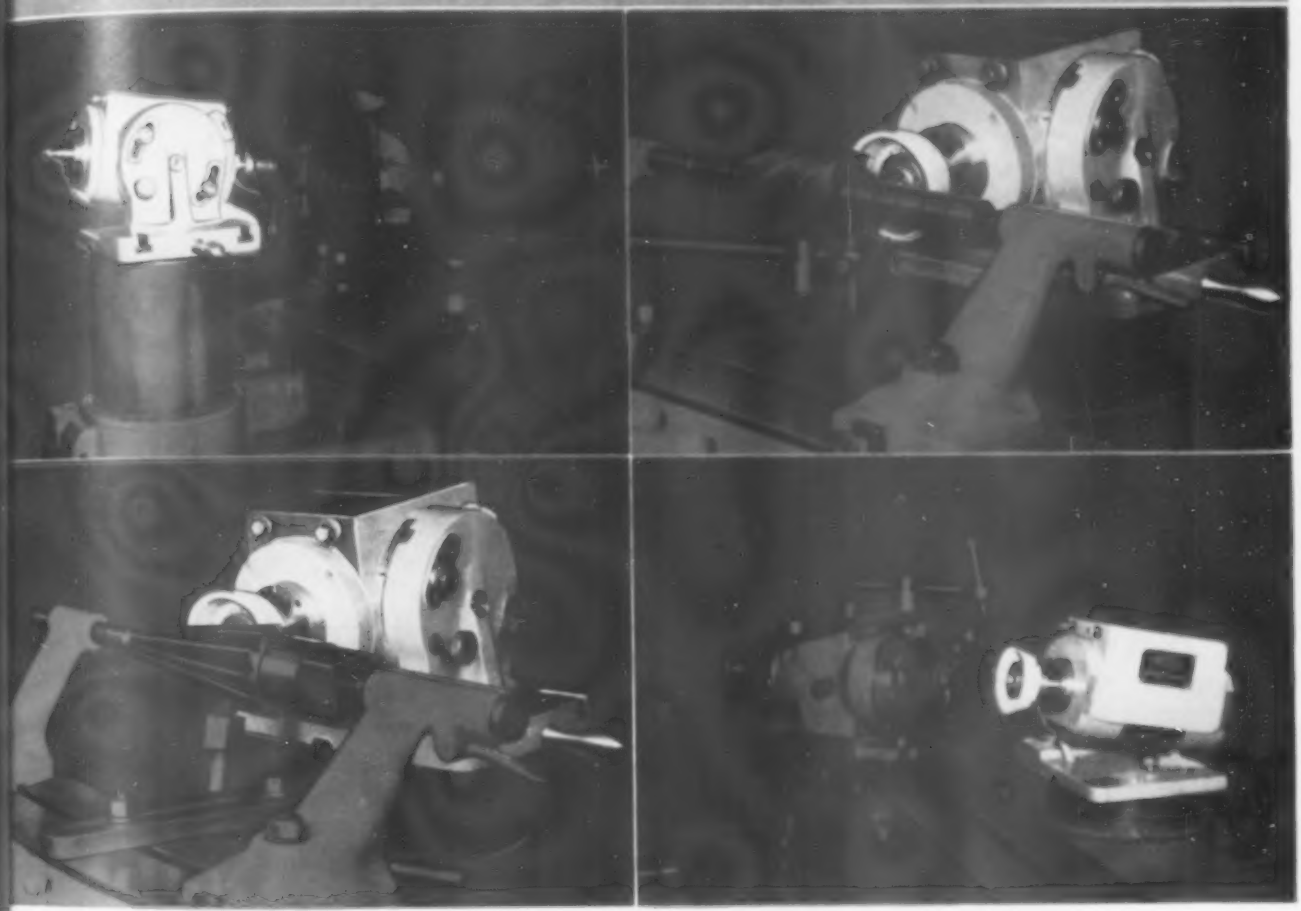
# NEW with new adjustment

# This POPE Motorized Tool and Cutter Grinder SPINDLE



Here's one you've always wanted — a totally enclosed, sealed lubrication, super precision 1 HP, 3600 RPM motorized tool and cutter grinding head, mounted on a new bracket that provides *angular adjustment in a vertical plane.*

POPE Spindles have the radial and axial rigidity to make wheels cut faster — spark out quicker. Grinding time is reduced. Softer wheels can be used for cooler grinding and for producing the kind of cutting edge that stands up.

Make the most of your present grinders. Equip them with this new and better POPE Spindle.

Ask us to quote price and delivery.

**SPECIFY THIS POPE SPINDLE ON YOUR NEXT TOOL AND CUTTER GRINDER**

**No. 71**

**POPE**

TRADE MARK REG. U.S. PAT. OFF.

**POPE MACHINERY CORPORATION**

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

# What in the hole is so fascinating?

Keller has made a new approach to the old problem of drilling holes.

As a result of that approach, Keller has developed a new, *different* hole-drilling tool—the AIRFEEDRILL.

It employs a new technique that enables workers to drill precision holes faster . . . reduce rejects due to outsize, ragged, or out-of-round holes.

The story of this new drilling principle is told in a new booklet called "THE HOLE STORY"—available free to those responsible for hole-drilling operations. Send for your copy.

*This is the Airfeedrill at work.*

**KELLER TOOL CO.,** Grand Haven, Michigan

Please send me a copy of "THE HOLE STORY" booklet.

Name_____

Job Responsibility_____

Company_____

Address_____

City_____ State_____

This quality feature is STANDARD construction on all-steel shank type

# DANLY DIE SETS

This cut-away section shows the stronger, safer Danly all-steel welded shank construction—the shank is an integral part of the punch holder—all solid metal.

## DANLY INTEGRAL WELDED SHANK

A new welding technique that assures 100% fusion of shank to punch holder makes this superior construction possible. Knock out holes in the shank itself or machining on the punch holder face are much less likely to effect shank strength.

Features like this make Danly the nation's leading die set producer. Check these other Danly Die Set advantages and you'll see why die makers and production men everywhere prefer Danly Die Sets:

- *prompt delivery* . . . from the nearest of the nation wide system of Danly assembly branches.
- *precision construction* . . . leader pins and bushings hardened and ground to precision tolerances and lapped after assembly to provide a smooth running fit.
- *broad selection* . . . the wide range of Danly standard and stocked special die sets meets nearly every tooling need.
- *Danly reliability* . . . every Danly Die Set is backed by the experience accumulated in more than a quarter century of service to the stamping industry.

**DANLY MACHINE SPECIALTIES, INC.**
2100 South Laramie Avenue, Chicago 50, Illinois

PRECISION DIE SETS . . . STANDARD AND SPECIAL

**WHICH DANLY BRANCH IS CLOSEST TO YOU?**

Danly Branch Offices: *Chicago 50, 2100 Laramie Avenue • *Cleveland 14, 1550 East 33rd Street • *Dayton 2, 990 East Monument Avenue • *Detroit 16, 1349 Temple Avenue • *Grand Rapids, 113 Michigan Street, N.W. • *Long Island City 1, 28-28 37th Street • *Los Angeles 54, Bucaramanga Metals & Supply Co., 4[illegible] South Alameda • Milwaukee 2, 111 East Wisconsin Avenue • Philadelphia [illegible] West Chelten Avenue • *Rochester 4, 16 Commercial St. • *Toledo [illegible] Street

DANLY®

# UNBRAKO

## KNURLED SOCKET HEAD SHOULDER SCREWS


## "HEAD AND SHOULDERS" ABOVE THEM ALL!

UNBRAKO Socket Head Shoulder Screws with *Knurled* Heads . . . are preferred by die-makers everywhere . . . but are useful for many machine applications. Their knurled heads provide a slip-proof grip—even if fingers and heads are oily or greasy—thus materially speeding production.

UNBRAKO Shoulder Screws are available in full range of standard sizes—other sizes to special order.

Write for further details, today.

*Knurled* Head Socket Cap Screws
Flat Head Socket Cap Screws
*Self-Locking* Socket Set Screws
*Knurled* Head Shoulder Screws
*Precision-Ground* Dowel Pins
*Fully-Formed* Pressure Plugs

**SEE US AT BOOTH 2434**
CONVENTION OF NATIONAL METAL CONGRESS AND EXPOSITION
CHICAGO, OCTOBER 23 TO 27

**SPS** — **STANDARD PRESSED STEEL CO.**

JENKINTOWN 37, PENNSYLVANIA

MONY A PICKLE MAKES A MUCKLE.

RIGHT YOU ARE, SCOTTY. LITTLE SAVINGS MAKE BIG ONES. THAT'S WHY WE STANDARDIZE ON SHIELD BRAND CUTTING TOOLS. IT SAVES TIME IN PURCHASING, IN THE STOCK ROOM, THE TOOL CRIB, AS WELL AS IN THE SHOP.


## *Features of*

## STANDARD SHIELD BRAND TOOLS

**Foremost Quality**—In design—workmanship—material.

**Complete Line**—One reliable source of supply for drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools.

**Complete Service Stock**—Over 10,000 items regularly carried in factory stock.

**Nation-Wide Availability**—Stocked and supplied by leading Industrial Supply Distributors coast to coast.

Our service staff is ready to help if you're faced with a tough metal cutting problem. They have been at it since 1881. Write us. There's no cost or obligation, of course.

# STANDARD TOOL CO. CLEVELAND 4, OHIO

**New York · Detroit · Chicago · San Francisco**

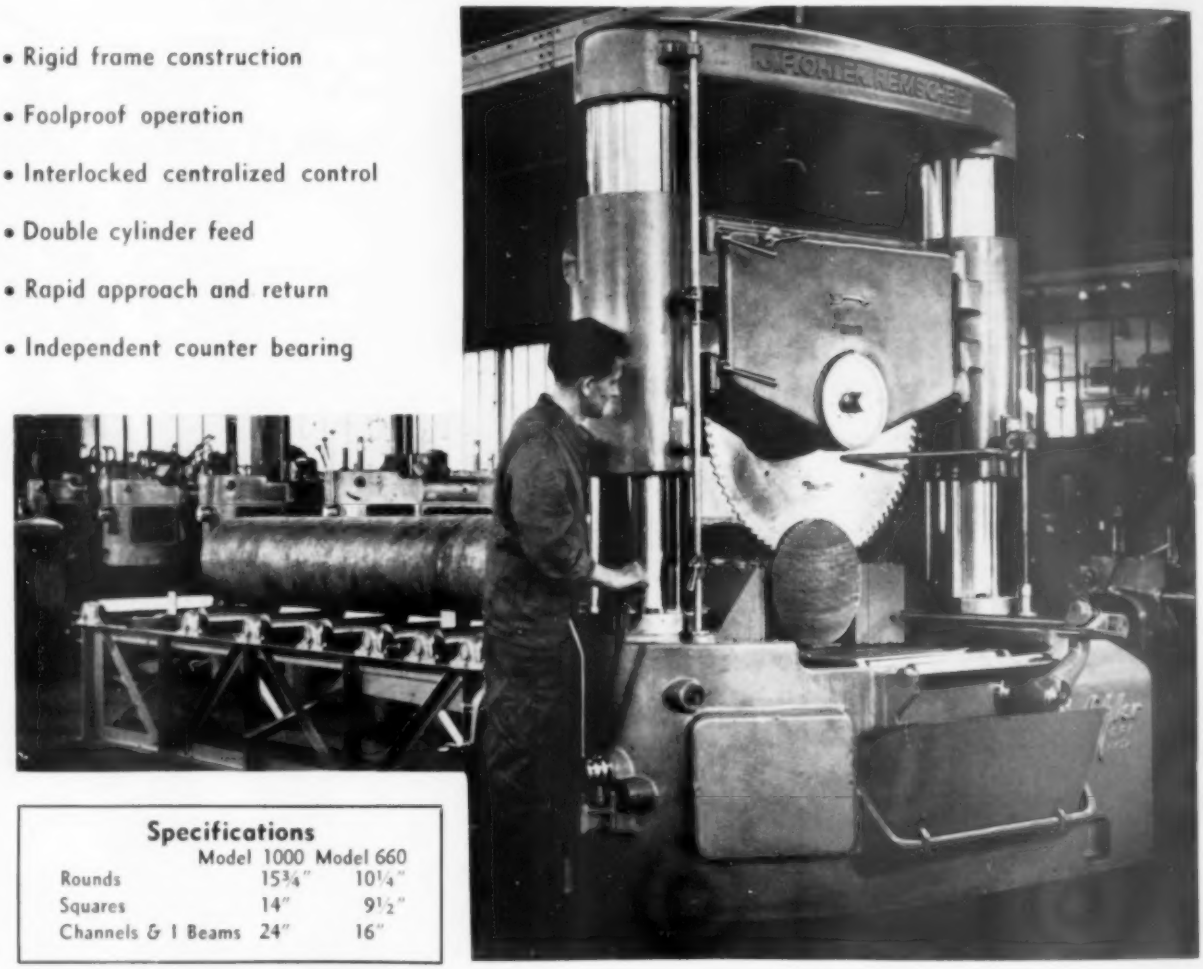
THE STANDARD LINE: *Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

FOR FURTHER INFORMATION, USE READER SERVICE CARD. INDICATE A-9-107

# A New Standard For Metal Cutting

**Mechanical perfection and modern design for greatest efficiency at low production costs is found in the Ohler Hydraulic High Speed Cold Sawing Machine.**

- Rigid frame construction
- Foolproof operation
- Interlocked centralized control
- Double cylinder feed
- Rapid approach and return
- Independent counter bearing



**Specifications**

| | Model 1000 | Model 660 |
|---|---|---|
| Rounds | 15¾" | 10¼" |
| Squares | 14" | 9½" |
| Channels & I Beams | 24" | 16" |

Model 1000

The cooling system is fed from both sides—runs into the cut—and remains there and keeps the cutting teeth always submerged, thus greatly increasing the cutting efficiency and life of the saw blades.

The Ohler Hydraulic High Speed Cold Sawing Machine incorporates features which assure smooth and chatterfree performance despite the enormous output of the machine. The carriage with its guide cylinders moves hydraulicly along the accurately ground columns and provides in itself additional reinforcement for the already rigid frame.

The saw blade is mounted in the exact center of the carriage and between the columns, providing the most direct cut.

WRITE FOR DESCRIPTIVE CATALOG

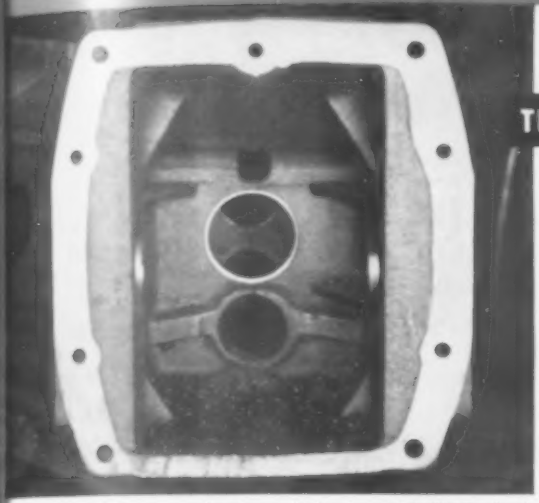
## KLINGELHOFER MACHINE TOOL COMPANY

20 PROSPECT ST., WESTFIELD, NEW JERSEY

OTHER OHLER PRODUCTS

| Original | Original | Original |
|---|---|---|
| Model KA-400 Full Automatic Machine—5" Capacity | Model 1500 Automatic Sharpening Machine—60" Capacity | Segmental Saw Blades 11" to 60" Diameter |

# H[illegible] WOULD YOU MEET THIS SPECIAL P[illegible]OBLEM OF TOOLING AND PRODUCTION?



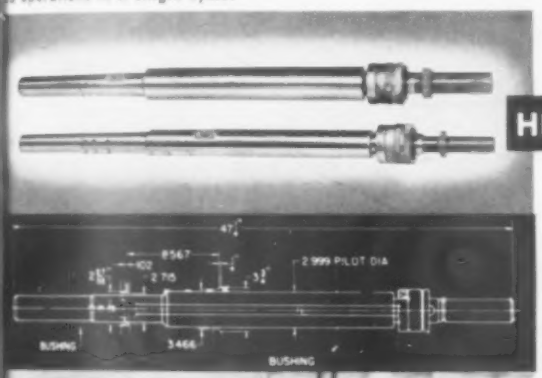
Tractor transmission case showing 4 holes in which S-J Tools do 5 operations in a single cycle.

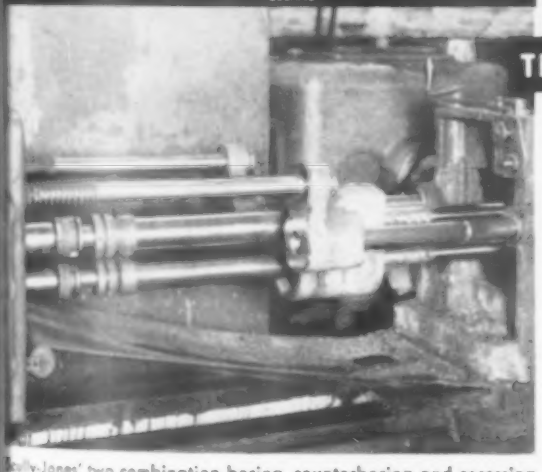
## THIS IS THE PROBLEM:

A tractor manufacturer faced this situation when cutting recesses in two holes in a transmission case. After completing boring operations in a W. F. and John Barnes Machine, the case had to be picked up by crane and moved approximately 30 feet to a radial drill press. The shape of the piece made chucking difficult and increased possibilities for error. Loading and unloading was slow for the recessing operations which only took 10 seconds. This tied up a man and a machine, both of which could be freed for other profitable production if the recessing operations could be combined with previous boring operations.

## HERE'S HOW IT WAS MET:

Two special bars were designed and manufactured by S-J to do the following operations: Each bar roughs, semi-finishes and finishes 2 bores, and cuts 1 internal recess. One of the bars also counterbores 1 hole as illustrated. The boring operations and recessing operations are now all performed on the case, at one pass of the bars in the W. F. and John Barnes Machine.



Scully-Jones' two combination boring, counterboring and recessing bars in machine.

## THE RESULTS:

By combining operations in one machine this tractor manufacturer got these advantages: (1) eliminated one handling operation, (2) freed one man and one machine for other production, (3) increased production, (4) improved accuracy of operations and reduced rejects by omitting one difficult chucking of the piece, and (5) saved tooling and production costs by combining operations on existing equipment.

**MEET YOUR SPECIAL PROBLEMS TOO, WITH**

# SPECIAL TOOLS

**DESIGNED AND MANUFACTURED BY SCULLY-JONES**

Draw upon S-J engineers' experience: Over 37 years designing and manufacturing production tools for the varied metal-working industries — such specials as: boring mill tools, internal and external recessing tools, quick change block boring bars, boring heads, step cutters, core drills, counterbores, spindle extension assemblies, tap driving tools and floating tools.

**SEND SKETCH** or sample work piece with details for a prompt quotation on your special tooling or production problem. You have a dependable source as to quality, price and delivery when you "put it up" to Scully-Jones.

**Scully-Jones AND COMPANY**

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

**YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS**


LET

**EX-CELL-O**

PRODUCE YOUR
PRECISION PARTS
AND SUB-ASSEMBLIES

**Having trouble holding close tolerances on production parts? Are precision sub-assemblies a bottleneck?** Ex-Cell-O has the know-how that will lick these problems and keep parts or sub-assemblies flowing to your plant in just the quantities you need. Ex-Cell-O has very complete parts production facilities, and being one of the largest precision machine tool manufacturers, can work out the most practical processing with both standard and special production equipment. Call your local Ex-Cell-O representative, or send a part print to Ex-Cell-O in Detroit for a quotation.

XLO

**EX-CELL-O CORPORATION** DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Warehouses
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*Nationally known*

# High Speed Steels*

**Red Cut Superior**
America's best known tungsten high speed steel—for all cutting purposes.

**Red Cut Cobalt**
Extra Duty—heavy cuts, fast speeds, hard or abrasive materials.

**E. V. M.**
Tungsten steel with higher vanadium—for increased tool life.

**VAN-LOM**
Molybdenum—Vanadium steel for all cutting tool purposes—especially good for fine edge tools.

**8-N-2**
Low tungsten—Molybdenum steel for all cutting tool purposes.

**Vasco M-2**
Tungsten-Molybdenum general purpose steel.

**Neatro**
Superior Wear Resistance—delivers top performance on non-ferrous materials, cast steel, cast iron, heat treated steels.

**Vasco Supreme**
Entirely New—higher hardness, higher wear resistance, higher hot hardness, higher speeds.

Our Latrobe, Pennsylvania plant is the only steel mill in the wo devoted *exclusively* to the manufacture of high speed steel.* wonder you are assured of steels free from harmful segregation—h from harmful decarburization—free from contamination. No won Vanadium-Alloys steels are the *first choice of most manufactur* of drills, reamers, taps, broaches, milling cutters, form tools, ho chasers, counterbores...wherever maximum performance is a necess

*Carbon and alloy tool steels are produced by our Colonial Steel Division.

FIRST QUALITY TOOL STEELS

**Vanadium-Alloys**
STEEL COMPANY
LATROBE, PENNA.

Colonial Steel Division

Anchor Drawn Steel C

# AIR CYLINDERS

*SOLID STEEL HEADS, CAPS and MOUNTINGS.* Eliminate dangerous, costly breakage under even the severest operating conditions . . . assuring longest possible cylinder life. Standard construction on ALL Miller Cylinders—*both Air and Hydraulic.*

*HARD CHROME PLATED PISTON RODS.* 90,000 to 110,000 psi yield point heat treated stress relieved steel, accurately ground, polished, then hard chrome plated for extra high resistance to the scratches that commonly cause leakage.

*DIRT WIPERS.* Wipe piston rods clean on every "in" stroke, protecting piston rods, seals, and bushings from scratch-damage by dirt, scum, abrasive particles. Standard construction on ALL Miller Cylinders — *both Air and Hydraulic.*

*NON-CORROSIVE BRASS BARRELS.* Eliminate the rust and corrosion caused by moisture always prevalent in plant air lines. Standard construction on all Miller Air Cylinders.

**Write for illustrated cylinder bulletins A-105 and H-104**

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION. LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI, HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

**MILLER MOTOR COMPANY**

4025-27 N. KEDZIE AVENUE - - CHICAGO 18, ILLINO

AIR AND HYDRAULIC CYLINDERS ACCUMULATORS COUNTERBALANCE CYLINDERS BOOSTERS AIR HOIST

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

*and Service from coast to coast*

# Long stroke


GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

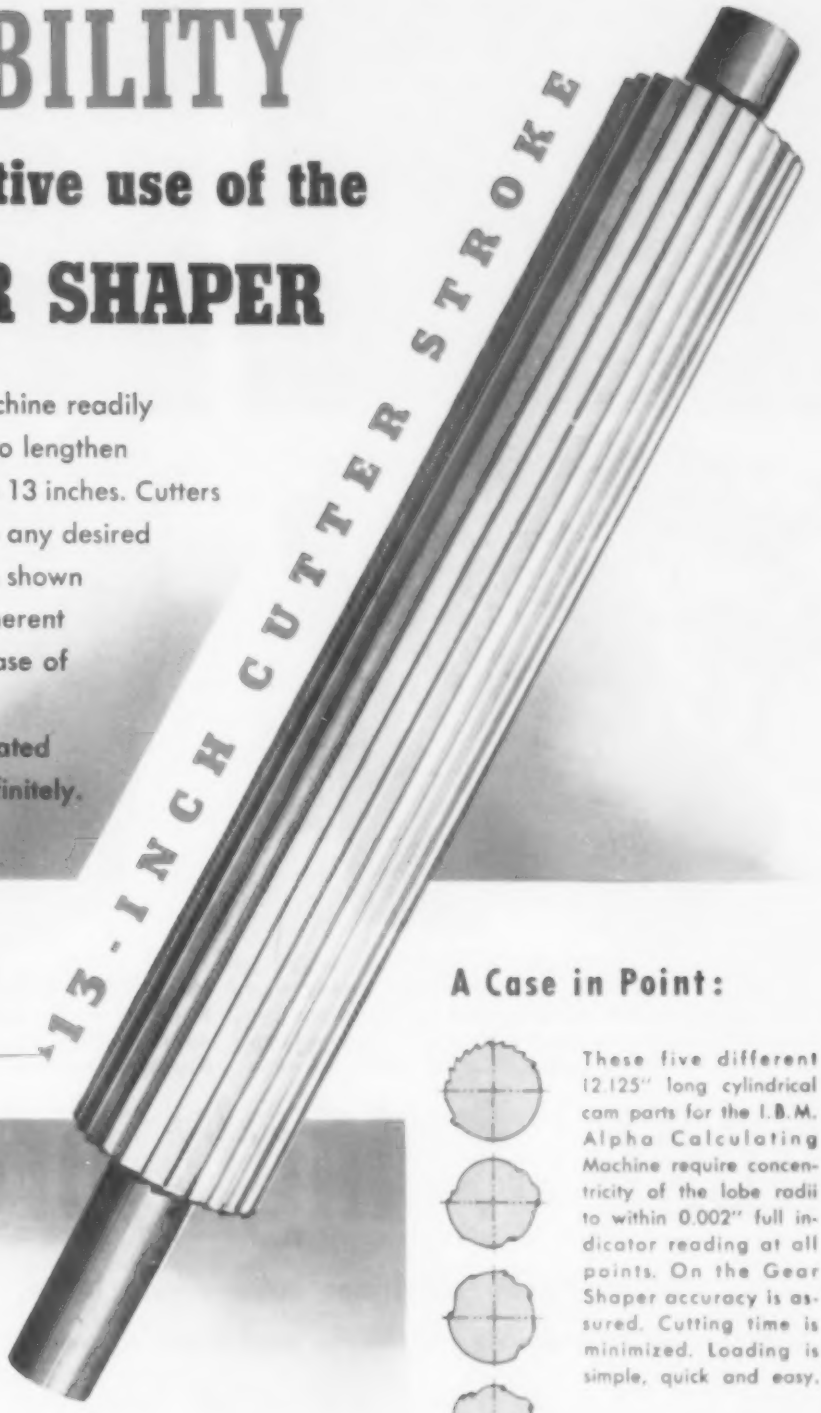
PLASTICS MOLDING MACHINES

# ADAPTABILITY

## invites imaginative use of the

# No. 36 GEAR SHAPER

Basic design is such that this machine readily accommodates a raised section to lengthen the normal 6-inch cutter stroke to 13 inches. Cutters can then be provided to produce any desired contour, such as on the slim parts shown here. The controlled precision inherent in the Fellows Cutter, and the ease of sharpening, makes possible the economical production of generated shapes to close tolerances, indefinitely.




DESIGN MODIFICATION PROVIDES

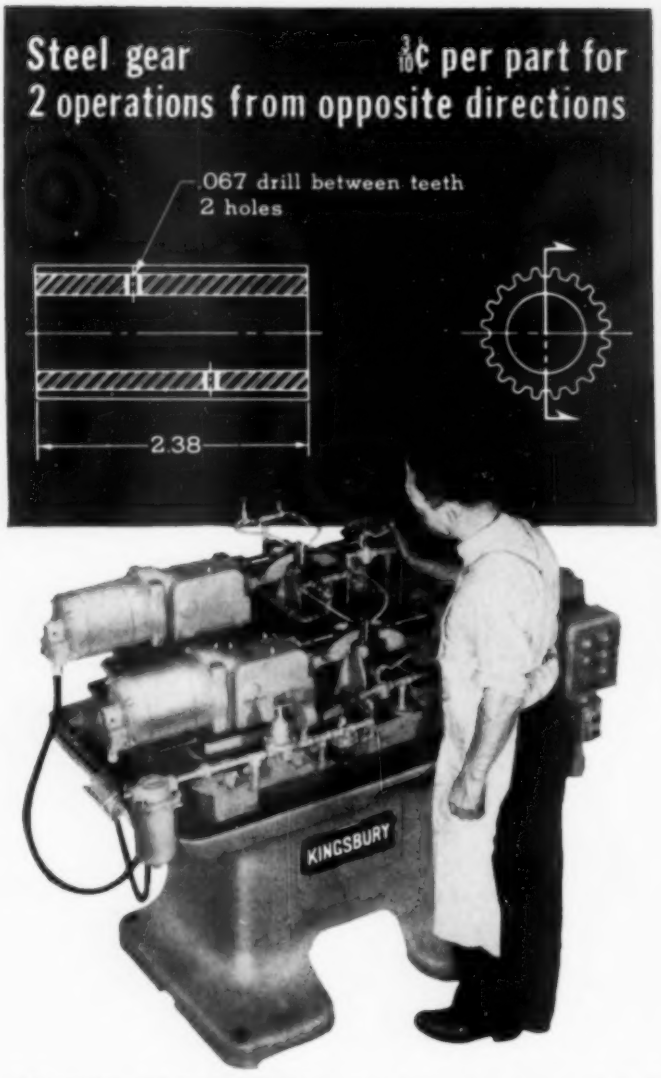
### A Case in Point:



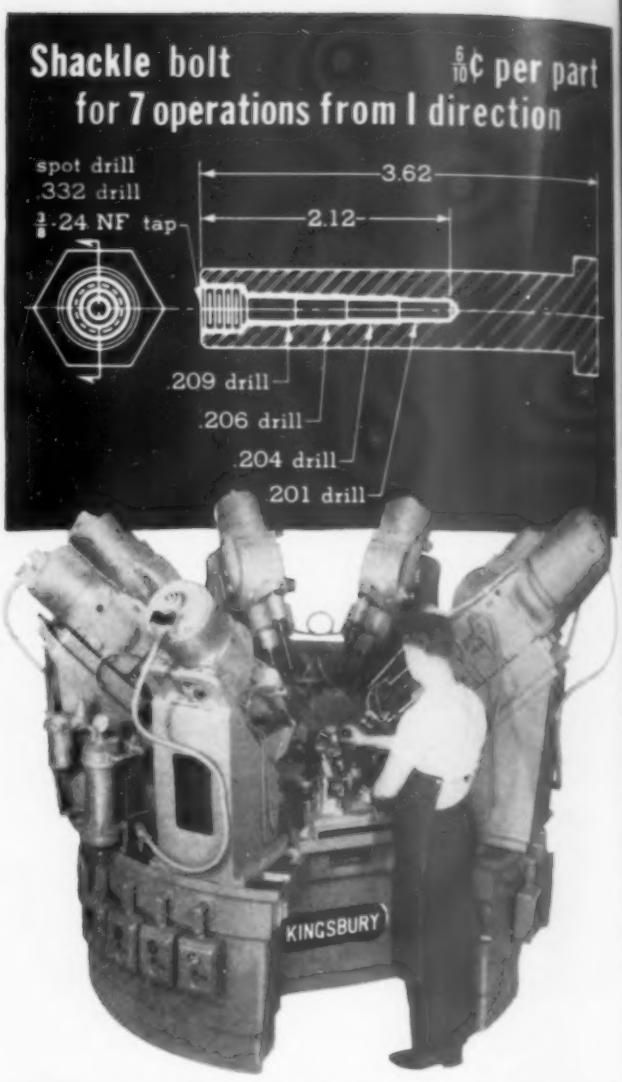
These five different 12.125" long cylindrical cam parts for the I.B.M. Alpha Calculating Machine require concentricity of the lobe radii to within 0.002" full indicator reading at all points. On the Gear Shaper accuracy is assured. Cutting time is minimized. Loading is simple, quick and easy.

*Fellows*

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.




**900 PARTS AN HOUR GROSS.** This setup saves money on a simple job. While the man changes parts in one fixture, two units locate and clamp another part, drill the holes and unclamp. He trips levers to start the cycles. Bushings guide all drills.




**1000 PARTS AN HOUR GROSS.** A 20-inch power index table has eight double fixtures and seven 2-spindle units that work on two parts at the same time. Angular mounting lets coolant flow inside the hole. Clamping and unclamping are automatic.

# These 4 high production

## Automatic, single-purpose machines save direct labor, handling, space and rejects on simple and complex work

Dear Sir:

Both jobs above are fairly simple. Those at the right are more complex. Some operations are easy, such as drilling the gear. Other operations are tough, such as milling through an arc on the transmission part.

In every case these machines save money because —

— each machine does the work of several general-purpose machines,

— there is almost no scrap.

### One machine replaces several

Automatic drilling, milling and tapping units perform the operations shown in one chucking of the work. At the same time, the man changes the work in another fixture. Each machine here does from 1,440 to 9,520 operations per man-hour (80% efficiency). That means savings in direct labor, handling and space.

### Empty scrap boxes

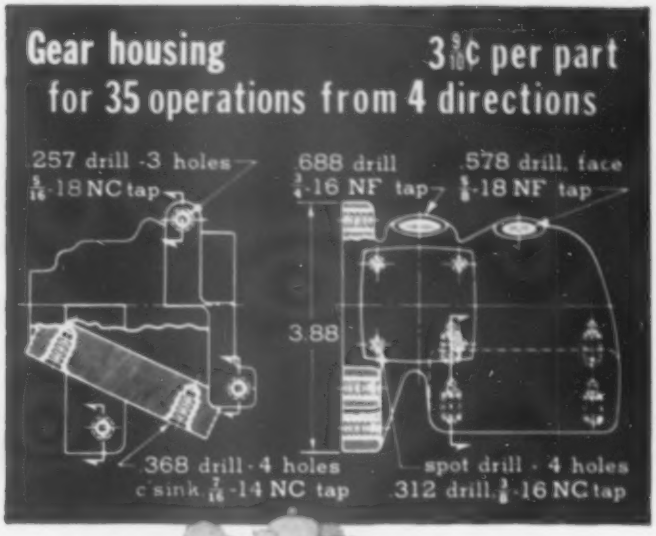
The inspectors won't toss many parts into the scrap boxes.

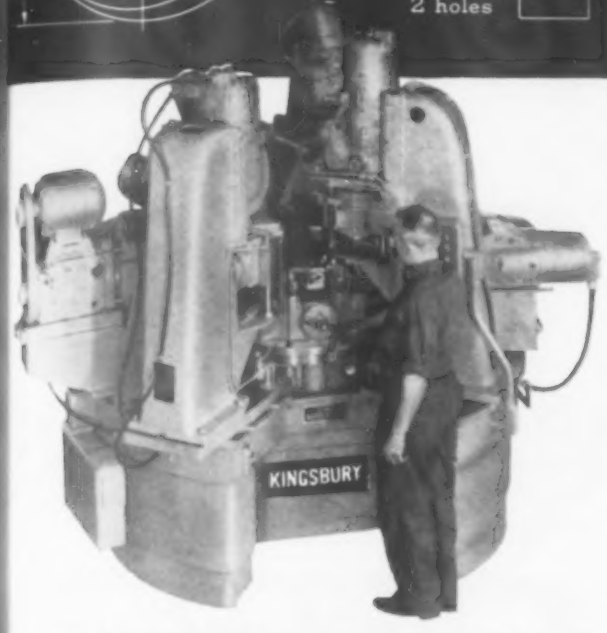
Tools work to close tolerances. We locate spindles to exact indicator readings and use precision bearings. Bushings guide drills and reamers.

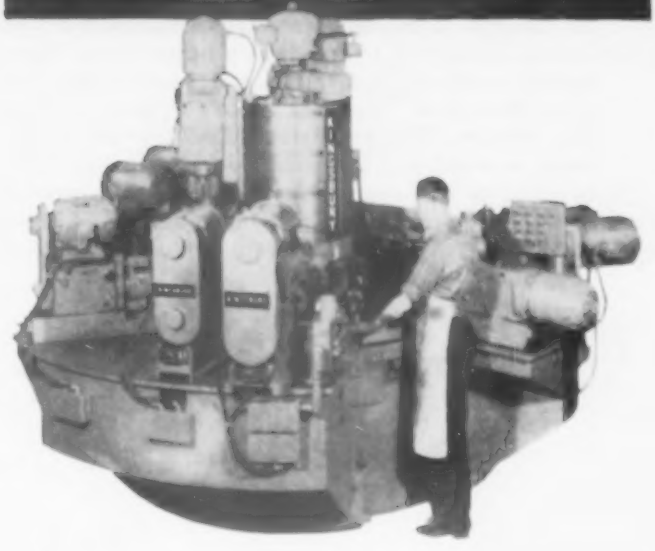
Product is uniform. Automatic work cycles never vary. Each part stays in its fixture undisturbed until after all operations.

Feeds and speeds are correct. We use single-spindle units to obtain the most efficient feed and speed for each operation. For operations of similar size and depth, units may have multi-spindle auxiliary heads.

Machines will do accurate work for years at intensive production. Wear parts are of heat treated alloy steel. Gears are induction-hardened and shaved. Castings and weldments are normalized before machining. Index tables and fixtures are jig bored to minimum toolroom tolerances.

**250 PARTS AN HOUR GROSS.** This 26-inch indexing machine has ten units — one 15° above the horizontal, four horizontal, one horizontal off the radial line, two vertical and two 25° off the vertical. One milling unit oscillates through an arc of 21°.

**340 PARTS AN HOUR GROSS.** A 60-inch power index table has 12 fixtures that rotate 90° during indexing. Two vertical units on the central column do three holes on one face. Nine horizontal units work on three faces. Bushings guide 14 tools.

# machines cut unit costs

### Was our face red

We might as well admit it here, since *This Week Magazine* has already printed it: For twenty years we paid taxes on a house we never built. Some of our customers kidded us, "Never make mistakes, huh?"

### How can you be sure?

How can you be sure we won't make mistakes on *your* machine? Well, it's possible. But as soon as it is set up, we test it with your sample parts. You get the samples to approve. If the parts do not meet your specifications, we work on the machine until you are satisfied. It won't take us long.

How can you be sure a Kingsbury will save you money? First ask our Mr. L. A. Carll for a proposal. Send him a print and tell him the operations and hourly output you need. Then compare that cost with your cost now. Find out for yourself using your own figures.

Sincerely,
Kingsbury Machine Tool Corp.
120 Laurel Street, Keene, N. H.

**About the costs on the drawings**

Each unit cost includes the man and machine on all operations shown — no power or overhead. We assumed three things: 1) 80% efficiency, 2) Each man's wage rate would equal the national average for such work, 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life.

**KINGSBURY**

**AUTOMATIC DRILLING & TAPPING MACHINES**
**for Low-Cost High Production**

# "no more GAMBLING on tool steel selection"


[½ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

*"Handiest selector I've ever seen"*

*"No more gambling on tool steel selection"*

*"You're right, the application should dictate the choice of the tool steel"* . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

***Here's how it works:***

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

***Here's an example:***

**Application**—Deep drawing die for steel

**Major Class**—Metal Forming—Cold

**Sub-Group**—Special Purpose

**Tool Characteristics**—Wear Resistance

**Tool Steel**—Airdi 150

One turn of the dial does it!

*And you're sure you're right!!*

Crucible Steel Company of America
Dept. T, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

**CRUCIBLE** first name in special purpose steels

**TOOL STEELS**

*fifty years of* Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.


*Get "Squared Away" on Shearing Costs*

# ...get SIMONDS "TUNGSWELD" Squaring Shears

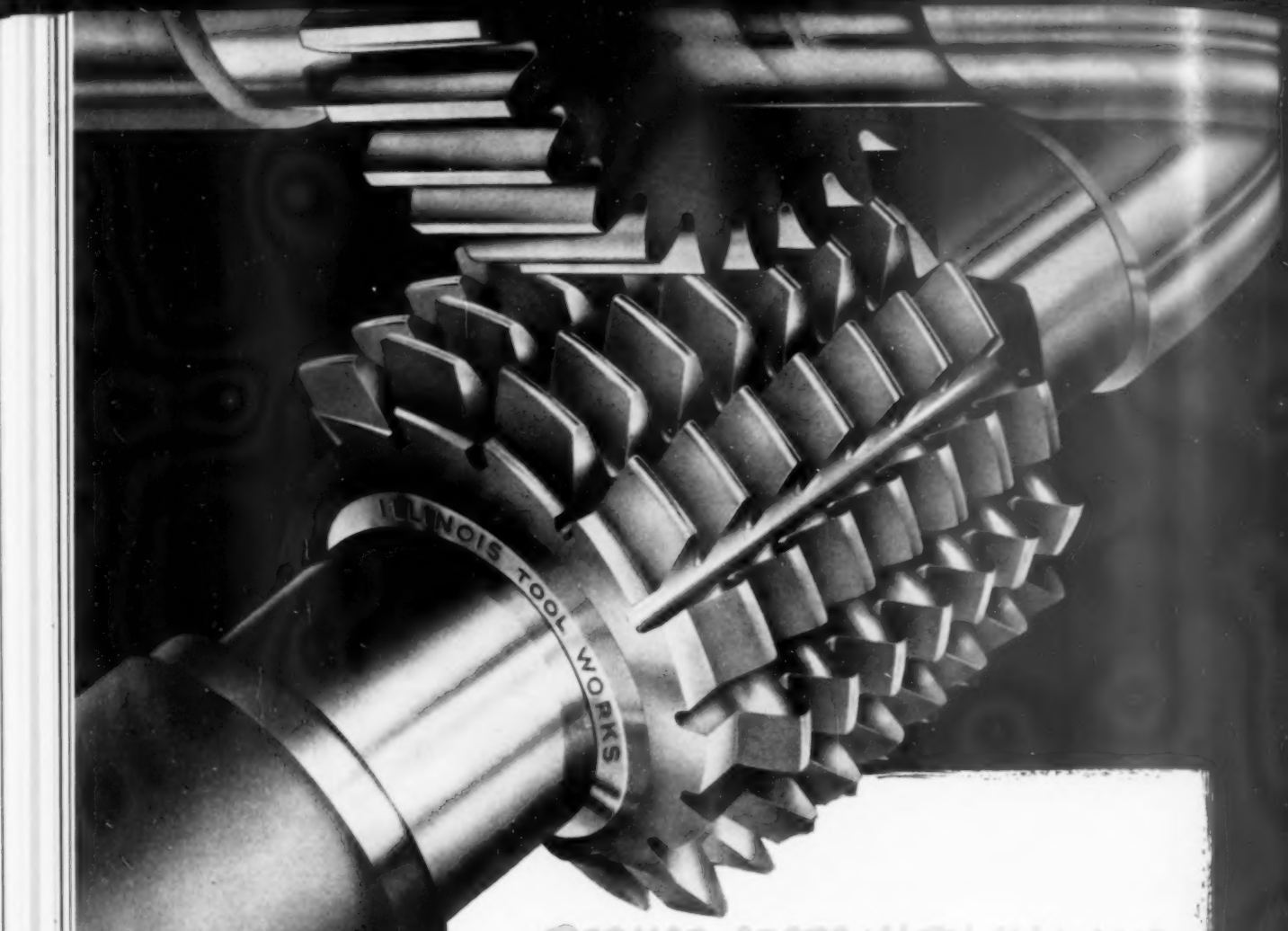
## (with the High Speed Steel Cutting Edge)

*For longest cutting life* between grinds, Simonds developed the "Tungsweld" method of welding High Speed Steel inlays to the tough steel backing of these Squaring Shears. This permits heat-treating *after* welding . . . assures full cutting hardness of the steel inlay, with longer cutting life.

*For easier cutting,* clearance is ground in the face and top edge . . . with accuracy and uniformity assured by special heavy grinders. The net result is a single-edge shear that outlasts other types . . . costs you less in down time and lost production . . . and gives the utmost in clean, fast shearing of tin plate, silicon, Monel, stainless or other thin sheet metal. Order from your local SIMONDS Industrial Supply Distributor.

**SIMONDS**
**SAW AND STEEL CO.**
**FITCHBURG, MASS.**

*Branch Offices in Boston, Chicago*
*Los Angeles, San Francisco and Portland, Ore.*
*Canadian Factory in Montreal, Que.*




# REDUCE COSTS WITH ILLINOIS CERTIFIED UNGROUND HOBS!

Every Illinois Certified Unground Hob shipped is accompanied by a Toolgraph* Chart like this . . . proof of accuracy!

**These Illinois Unground Hobs can in many cases replace ground hobs . . . and assure longer tool life too!**

Actual production experience has proved that, depending upon size and pitch, Illinois *Certified* Unground Hobs provide maximum tool efficiency for pre-shaving, pre-grinding and finishing operations. Initial costs are lower, and it has been found in many cases that the longer hob tooth allows more gears to be produced before replacement is required.

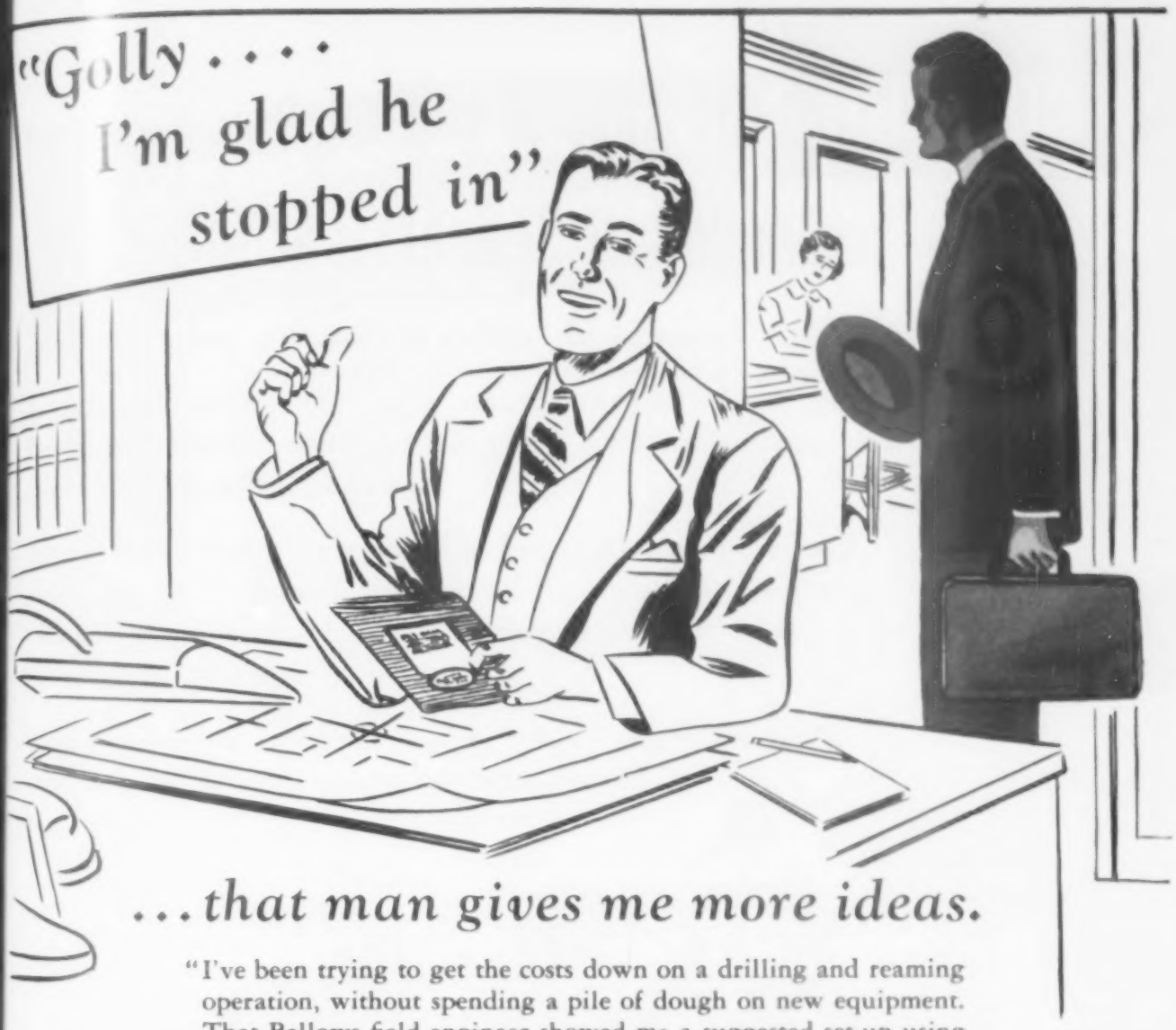
Write today for complete information on Illinois *Certified* Unground Hobs . . . see how they will reduce your gear hobbing costs. Illinois Tool Works, 2501 North Keeler Avenue, Chicago 39, Illinois.

*"HEADQUARTERS FOR ENGINEERED CUTTING TOOLS"*

# ILLINOIS

## TOOL WORKS

*T.M. Reg. U.S. Pat. Off.




## . . . that man gives me more ideas.

"I've been trying to get the costs down on a drilling and reaming operation, without spending a pile of dough on new equipment. That Bellows field engineer showed me a suggested set-up using an air-powered rotary work feed table hooked up with a couple of air-powered feeds that will be the answer on this job."

YES, your Bellows Field Engineer is a good man to know. He's one of some fifty field engineers we have in the principal cities and industrial areas. They are full time Bellows men . . . sell no other line of equipment. These men know production. They are skilled in the use of "Controlled-Air-Power." They have at their fingertips facts, photographs, wiring diagrams, motion pictures, etc., showing how plants, large and small, in all lines of industry, are using Bellows "Controlled-Air-Power" to cut costs.

When he calls to see you, talk with him. He's at your service, without cost or obligation. He can help you save time and money.

**The Bellows Co.**

**AKRON, OHIO**

1135

● You'll find your Bellows Field Engineer listed in your local telephone directory, or write us direct and we'll have him get in touch with you. *Dept. TE 950*

**MANUFACTURERS OF AIR MOTORS, AIR CYLINDERS, AIR-POWERED WORK AND TOOL FEEDS, AIR-OPERATED WORK HOLDING AND CLAMPING DEVICES AND OTHER "CONTROLLED-AIR-POWER" DEVICES FOR FASTER, SAFER, BETTER AND *LOWER* COST PRODUCTION.**

# contour the special job on a Cincinnati Shaper...at low cost

The special job is often a time-eater — and a cost raiser.

This handy Cincinnati Shaper saves time — saves money — on many special jobs. Little time is lost on setups — costly fixtures and special equipment are not needed.

Contouring this 1200-pound tank stave die — roughed and finished in 4 hours — is done at low cost with simple tools and simple setup. It is an example of many jobs performed on versatile Cincinnati Shapers at lowered costs.

Write for Shaper Catalog N-5, where many uses of Cincinnati Shapers are illustrated, and the wide line described.


**THE CINCINNATI SHAPER CO.**

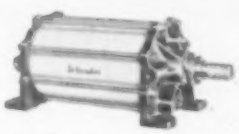
CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

# Here are a few of the NEW Schrader Air Control Products

**Acclaimed by Industry for cutting costs, boosting production and increasing efficiency.**

NEW HAND FERRULE CONTRACTING TOOL—An inexpensive, pocket-sized tool. Just what maintenance men have always wanted. Built on an entirely new and effective principle. Handles a wide variety of ferrule diameters.

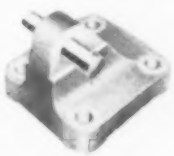


NEW "SERIES 3" AIR CYLINDERS—One of four types of mountings in the new series. Single and double acting. Diameters 1" to 8". Any stroke.

NEW 3-WAY VALVE—designed especially for operating small bore single acting cylinders such as the new air clamps.

NEW BANTAM-SIZE AIR CLAMPS—deliver powerful push. Variety of strokes. Available also in a base mounted type.

NEW QUICK EXHAUST VALVE—Quickly exhausts cylinders; speeds up piston travel; prevents back pressure. Completely automatic.



NEW CYLINDER BASE BRACKETS—Ready mount for all clevis types of cylinders.

NEW HAND-OPERATED 4-WAY VALVE—A diaphragm type of valve for actuating double acting cylinders. A touch of the finger operates it.

NEW PILOT VALVES—for control of water, air or fluids—can be timed.

NEW SOLENOID-OPERATED VALVES—One of several new types of Schrader electrically-operated valves for remote control.

NEW CHECK VALVE—A new addition to our check valves—features a spring loaded check to insure a positive seal at low pressure.

NEW TWO-OUTLET VALVE—Similar to one of our most popular types but with two outlets for sending air flow in two directions at once.

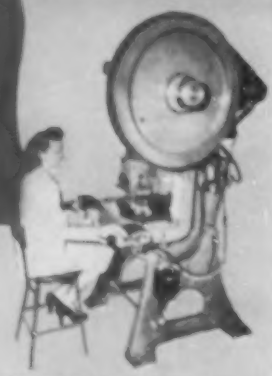
NEW AIR EXHAUST MUFFLER—Silence where noise of exhaust air must be reduced.

NEW AIR LINE FILTER AND WATER TRAP—New design of our best trap. Filters without restricting air. High capacity.

NEW AIR LINE FILTER—New design, using a new filter material to clean air. Easy to drain.

NEW AIR LINE LUBRICATOR—Provides ideal lubrication for air entering cylinders, clamps and other devices.

NEW ROTATING PRESSURE JOINTS—One of several newly designed for connecting air in fixed and rotating members.



**MORE WORK, LESS REJECTS with FOOT PRESS CONTROLS**

Stop pedal-pushing! You'll get more strokes, more uniform strokes with no manual effort with a Schrader Foot Press Control on the job. Easy to install. Complete sets for foot operation or hand-and-foot operation also available.

**PROTECT HANDS, END FATIGUE with SCHRADER PRESS CONTROLS**

Keep hands out of the way, eliminate the tiring let-down that dulls alertness, leads to accidents, and low production. Schrader makes hand-operated sets for maximum safety, also foot-operated and combination hand-and-foot operated sets.

**MAKE ONE SHEAR DO THE WORK OF TWO**

Replace arduous foot leverage with a Schrader Shear Control and watch production go up! One man can position as well as operate the shear. One shear can handle heavier gauge metals and often do the work of two.

**Keep your eyes on Schrader... more New products on the way!**

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# Index of The Tool Engineer Advertisers

SEPTEMBER, 1950

*The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error of omission.*

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## —in cutting costs with SUPER-FINISH Universal Drill Bushings

There's longer life in Universal Standard Drill Bushings because the bores are Super Finished. These Super Finished bores *reduce tool breakage and drill wear,* eliminate galling, have no sharp edges on which tools can hang up. Standard sizes available for immediate shipment. Universal warehouses at 1060 Broad St., Newark 2, N. J., and 5045 Sixth St., Kenosha, Wis., offer *prompt sectional delivery and information.* Cut production costs by specifying Universal Drill Bushings.

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*Facilities available for special hardened and ground precision parts made to customer specifications.*

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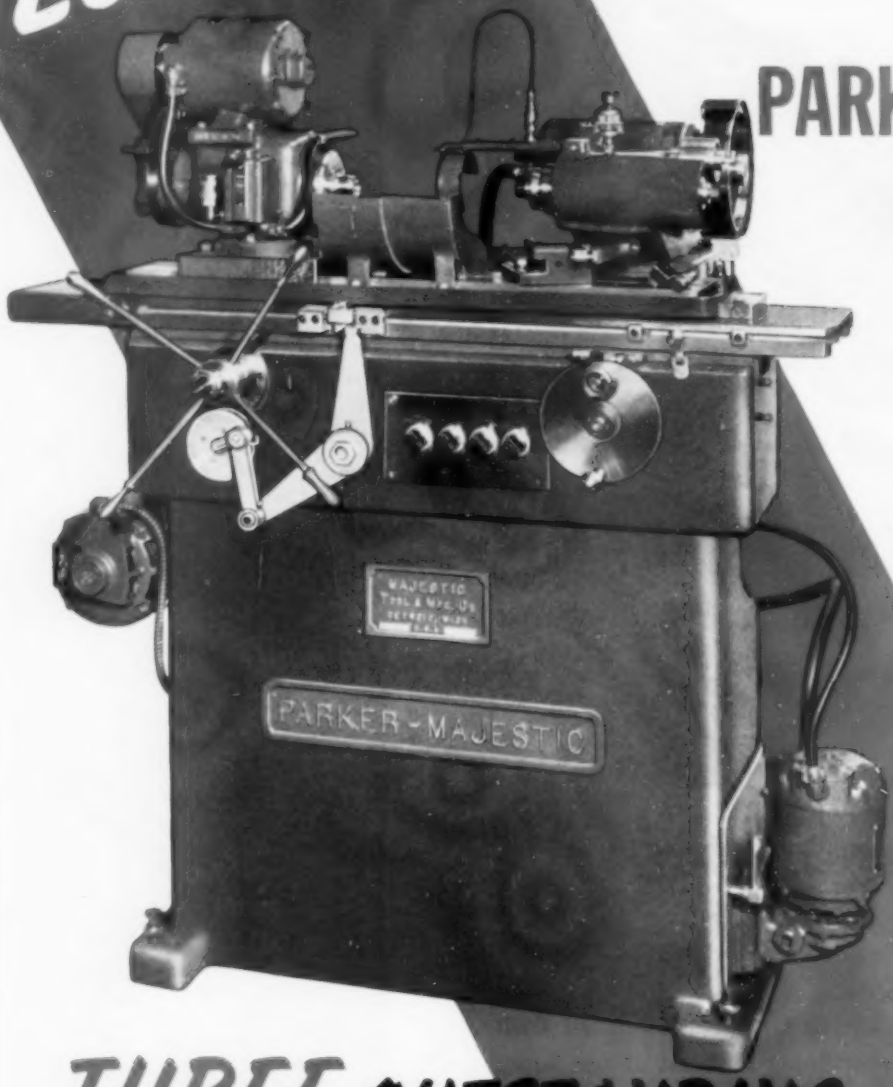
## The PARKER-MAJESTIC GRINDER Gives Smoother Performance

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# How WALES Strippits* ay for themselves every time ou remove stripper plates

*Illustration 1*

The ease of removing a Stripper Plate from a pu by simply backing off the screws that hold the S per Plate to the Strippits is shown in illustratio Replacing the Stripper Plate on the punch is acc plished just as easily and quickly. That's why S *pits pay for themselves each time* you remove Stri Plates.

Illustration 2 shows Strippits used with Stri Plates in a blanking die. The use of Stripper P with Strippits is for one purpose only—to elim markings on the work. Illustration 3 shows punc out blanks in place of the Stripper Plates. Note center blank is elevated above the cutting edg the die for easy, quick removal of the work from

Illustration 4 shows the 5 Stripping Plates tha eliminated by using Strippits. The simplicity of construction, greater economy by minimizing parts, and ease of installation is made possible with Strippits.

Write TODAY for fully-illustrated Catalog S have the Strippit story at your fingertips.

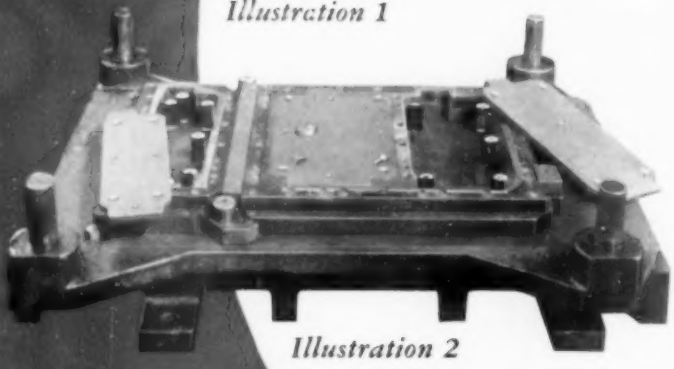


*Illustration 2*

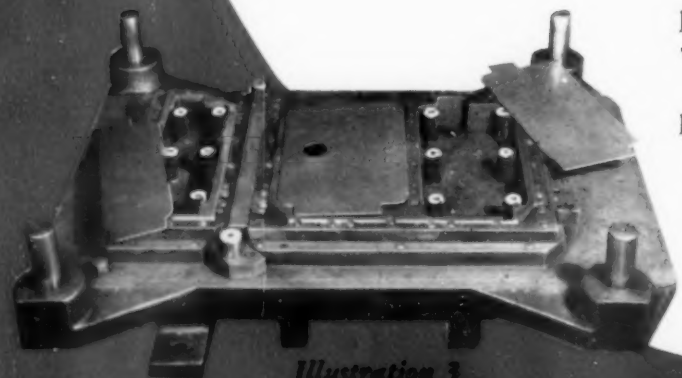
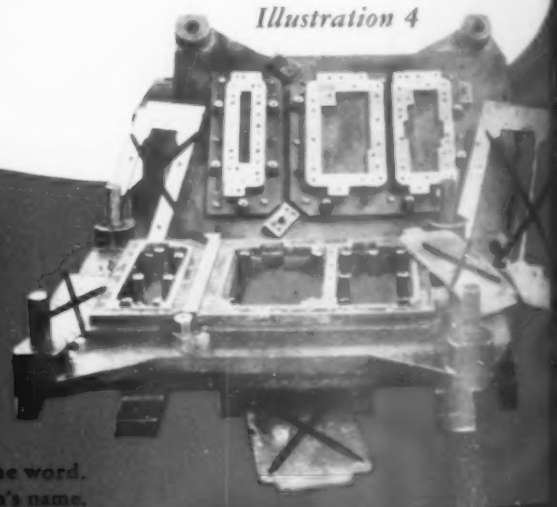


*Illustration 3*

*Illustration 4*



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